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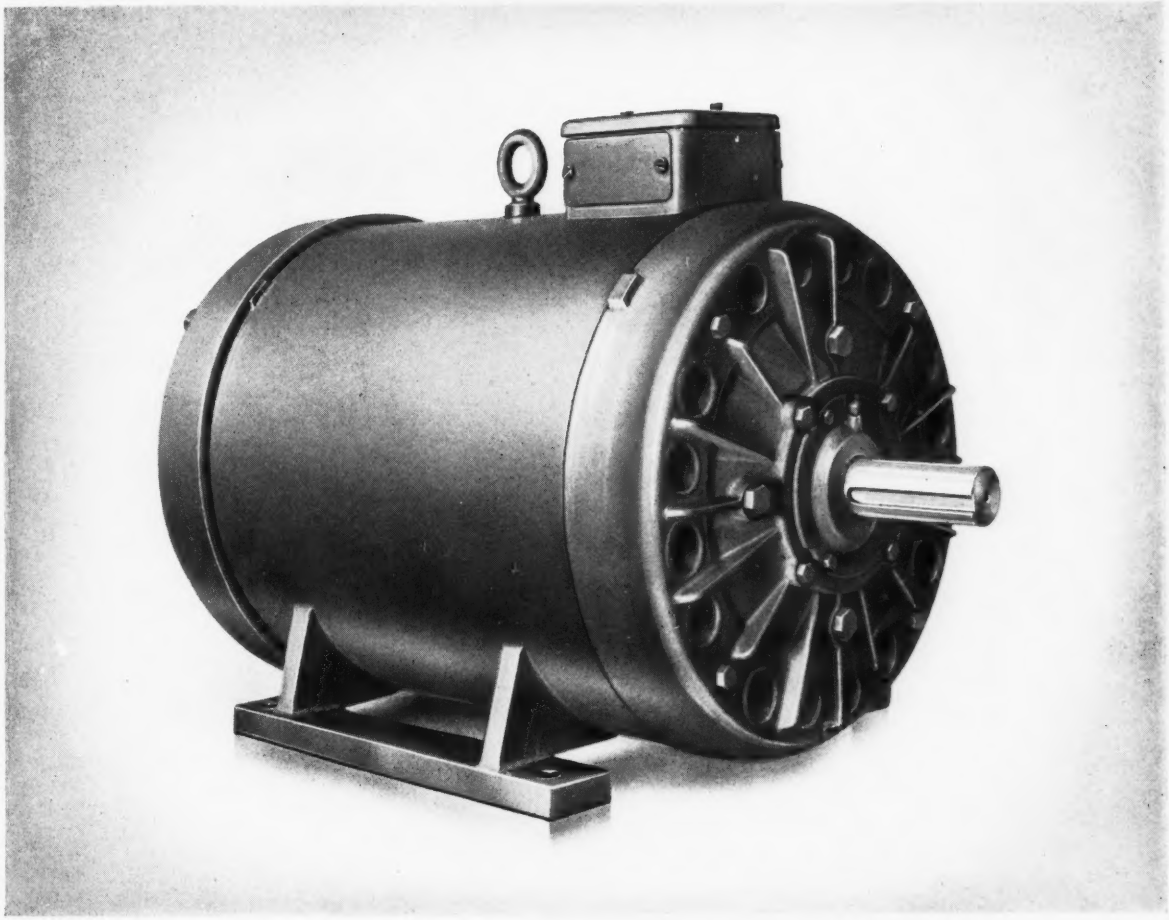
ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXVIII. No. 3311 MAY 9, 1941 SIXPENCE



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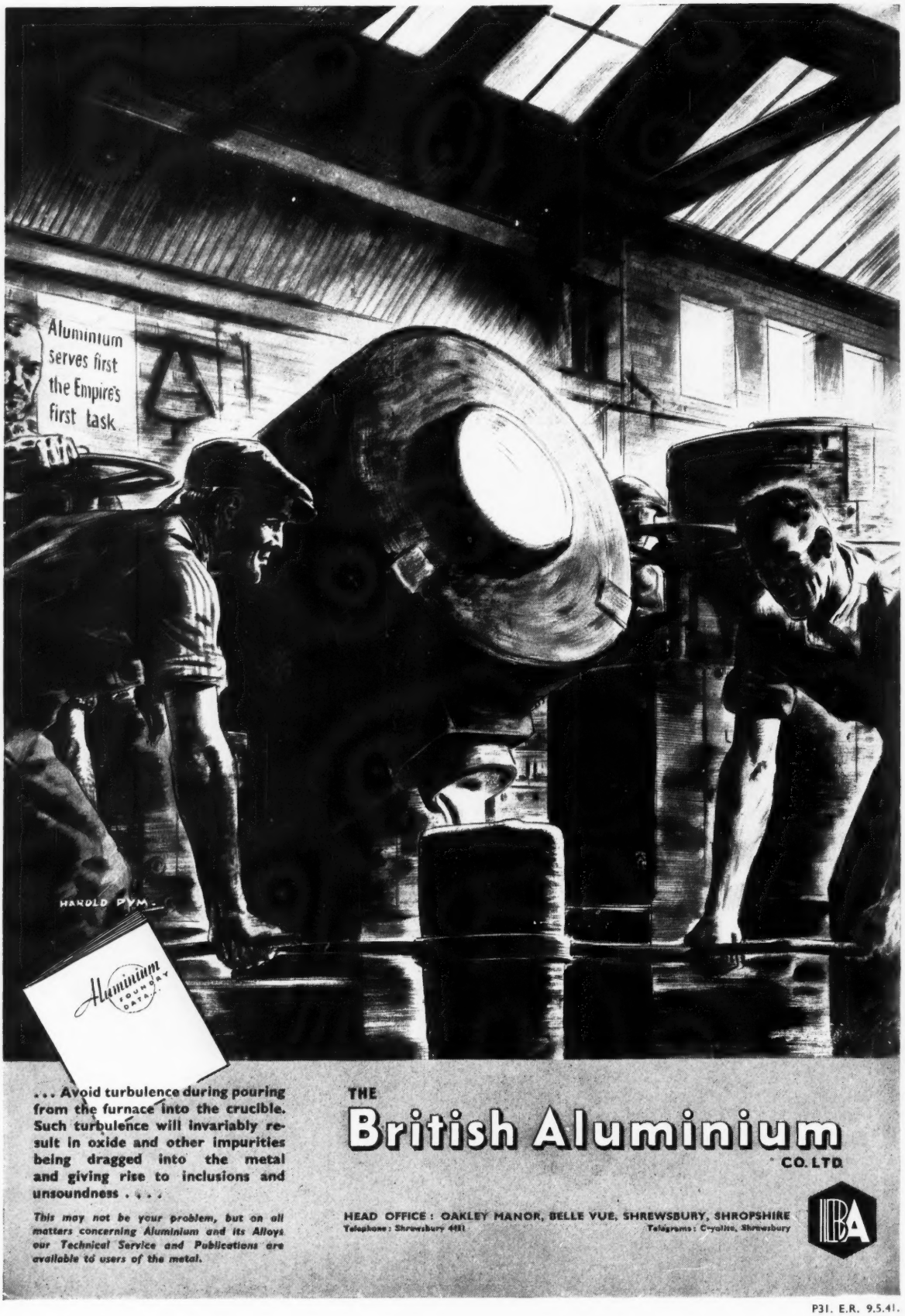

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THE ELECTRICAL REVIEW

Volume CXXVIII — No. 3311

Friday, May 9, 1941

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EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1

Telegraphic Address: "Ageekay, Sedist, London." Code: A B C. Telephone No.: Waterloo 3333 (35 lines)

Subscription Rates, Postage free: United Kingdom, £1 16s. 10d.; Canada, £1 12s. 6d.; Colonial and Foreign, £2 1s. 6d. per annum

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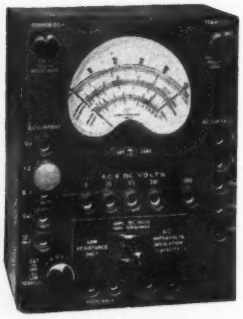

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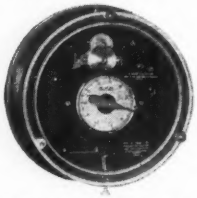

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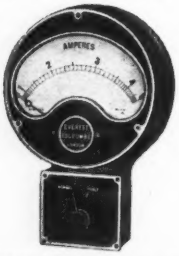

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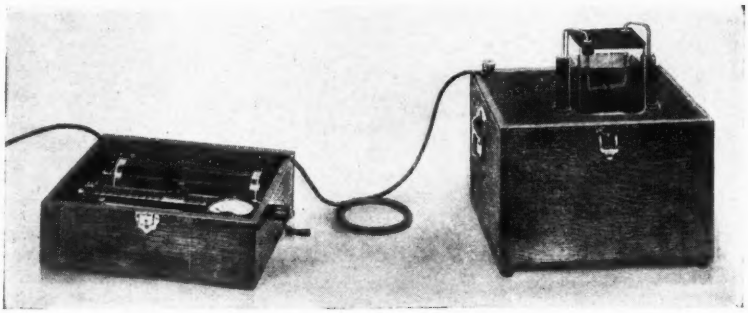

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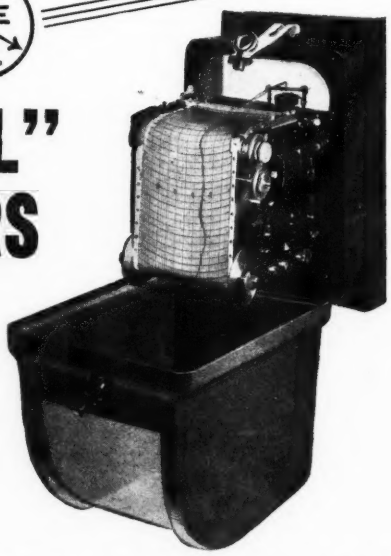

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THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXVIII. No. 3311 MAY 9, 1941 Price SIXPENCE

Grouping of Contractors

Necessity Which may Prove a Virtue

IN our leading article of April 11th we gave some consideration to the position of small electrical contracting firms in the circumstances raised by the war, particularly the shortage of work for them and of material and labour when orders were secured. We referred then to a proposal that these firms should form district groups, probably in the shape of companies floated for the purpose, and merge their businesses for the period of the war, at the same time making an endeavour to retain their individuality in some way or other.

We suggested that it was a matter which the Electrical Contractors' Association might take into consideration, but in this connection we must point out that the Association has no power to form such companies as those proposed. All it is able to do within the limits of its constitution is to give advice and assistance to its members, although it has been hinted that the assistance might sometimes take a financial form.

E.C.A. Memorandum

Acting on these lines the E.C.A. has now circulated a memorandum on the subject to its members in which, in the first place, the reasons for the regrettable necessity are set out. The outstanding feature of the whole matter is that electrical contractors (and retailers) operating on a small scale on non-Government work can seldom hope to continue their struggle for existence for long. They will inevitably have to begin eating into their capital and gradually but surely come to an end of their resources. Moreover, it is probable that the Government would not continue to view with favour the maintenance of the contracting industry at anything like peacetime strength when the skill and labour involved are so badly needed for national purposes.

So far as the retail side is concerned, the drastic reduction of the quota available under the Limitation of Supplies (Miscellaneous) Order has made it impossible for dealers to obtain sufficient stocks to maintain their businesses. Added to this, the operation of the Purchase Tax and the fact that overhead charges have to be borne by a very much smaller number of appliances, have increased prices to such an extent as to place equipment out of the reach of many would-be purchasers.

Faced with the alternatives of combination or extinction, contractor-retailers can surely make only one choice—the former. The E.C.A. does not consider that any arrangement on the basis of mutual understanding is likely to be satisfactory ; something more definite and binding upon all concerned is essential.

What is proposed is that an area should be taken and that the contractors operating in it should weigh up the possibilities in the way of work and on this basis calculate the requirements as to equipment and labour, with due regard to the possibility of expansion. They should then form a limited liability company, of which the principals of the merged concerns would be directors, deciding which of them should be active and which " sleeping." The capital of the company would be allocated proportionately to the resources and goodwill of each unit, and in this direction the E.C.A. would probably be prepared to provide the services of a professional valuer to ensure an equitable arrangement.

The identity of the merged businesses would be preserved by the appearance of their names on all letter headings and business stationery of the company. The disposal of redundant premises would present a problem, but it is not thought that there would be any great difficulty in solving it. It is stressed that the premises retained by the combination should be attractive and possess adequate showroom accommodation.

Absorbing Redundant Personnel

The absorption of the personnel released by such a scheme, whether managerial or operative, should be rapid at a time when the demand for such men is so pressing. Indeed, it is that demand which has been a leading factor in bringing about the present position.

We have referred to the possibility of the affording of financial assistance by the Electrical Contractors' Association. It is suggested that a general meeting of members might authorise the use of part of the accumulated funds of the Association (which are substantial) as advances to assist in the formation of group companies where this was absolutely necessary. These advances would be secured upon the companies' assets at a nominal rate of interest.

If all this is considered to be a very regrettable necessity, it is not entirely unrelieved by brighter aspects. For instance, such groups as those envisaged would be in a position to take on much more important contracts

which at present pass the smaller firms by, and may thus prove to be the salvation of them all. It is conceivable that the benefits of co-operation may be found to be so great that when it comes to consider the redivision of the businesses after the war the idea will be rejected as most undesirable.

Electrical Engineers and the War

THE appointment by the Government of an Engineering Advisory Committee is a necessary corollary of its action last October in setting up a Scientific Advisory Committee. It indicates a recognition, however tardy, that engineering experience is needed to deal with most of the more immediate applications of science that are urgently required in the prosecution of the war. Lord Hankey, as chairman of both Committees, will provide official liaison. The vice-chairman of the new Committee, Lord Falmouth, a Companion of the Institution of Electrical Engineers, has the close knowledge of the affairs of our industry that is obtainable from the vantage ground of a past-president of the E.D.A. The members of the Committee "charged with electricity" are the President and two Past-Presidents of the I.E.E., but these are very much more than merely *ex-officio* appointments. Mr. J. R. Beard has been responsible for many large power supply schemes, with all that involves in the way of an intimate knowledge of the industry as a whole, while Dr. A. P. M. Fleming and Dr. C. C. Paterson, both directors of research in large electrical manufacturing concerns, have had unique opportunities of obtaining a close knowledge of just the kind of problems the solution of which is likely to lead to early practical results.

Whither the Commission?

ONE result of the combination of the Ministries of Shipping and Transport will be the separation from the latter Ministry of a number of functions which it has hitherto exercised. One of these is almost bound to be the control of electricity supply and naturally speculation is aroused as to the future of the Electricity Commission. The most obvious existing home for it is the Board of Trade which originally administered electricity supply and still looks after gas. Maybe the Mines Department of the Board will have its functions enlarged to embrace electricity ; already it has a voice in electrical affairs, for instance, in the supply of fuel to generating stations and with regard to rationing. Definite information is unobtainable at the moment of writing ; we are told that no decisions have yet been taken, but no doubt they will not be long delayed.

Information Wanted

RECENTLY a ban was placed upon the publication of their accounts by public utility undertakings lest useful information should be given to the enemy. While opinions may differ upon the necessity for a total prohibition of this kind it is as well to remain on the safe side. Unfortunately many undertakings have received the impression that the divulgence of any information, however innocuous, is now forbidden and are accordingly keeping to themselves matter of considerable interest to the electrical industry as a whole and of no value whatever to the Axis in a military or economic sense. Something similar happened a few months ago when the Iron & Steel Control sought to smother the provision of information by all firms coming within its ambit. The Press, in conjunction with the Ministry of Information, was able to secure the withdrawal of a letter which had been circulated and the situation was eased. We consider that the Ministry should again take a hand in this matter and suggest to public utility undertakings that they need not be afraid of letting the Press have news items. It is the responsibility of the Press to decide whether such items are likely to assist the enemy and to take appropriate action before they publish them.

I.E.E. Progress

YESTERDAY afternoon the report of the Council of the Institution of Electrical Engineers for 1940-1 was presented to the annual general meeting. While the increase in membership of 403 (bringing the total to 20,275) is considerably less than the recent annual average, it contrasts favourably with the actual decline experienced during the first three years of the last war. The inevitable losses among the Members were not made good—indicating a strange diffidence regarding their professional qualifications of many who are still Associate Members ! The state of the Benevolent Fund is improving, but not to the extent, we fear, to meet the probably greater claims on it in the future. As it is, it owes too much to "windfalls" and to the generosity of a few. Regular contributions, even in small individual amounts, from the whole body of members would indicate a far more healthy position. It should be borne in mind that if these can be definitely promised for seven years, their face value will be materially increased owing to the rebate of income tax that would be allowed.

Rates and Charges

WE have drawn attention on many occasions to the inequity, or even iniquity, of making electricity consumers pay more than their fair share of local rates by robbing the municipal Electricity Department to bolster up the rate fund. Worse than this, there have been cases in which municipal undertakings have actually increased their charges to enable the contribution to the rates to be continued. This is a matter on which the Electricity Commissioners should keep a watchful eye and we have reason to believe that they are doing so. In a recent case which came before them they suggested to the authority that it should bear in mind a statement made by the late Captain Euan Wallace when he was Minister of Transport that he "would not regard it as reasonable under war conditions that prices should be so increased as to maintain profits or to enable aid to be given to local rates at an unfair level." Another point to be borne in mind is the Chancellor of the Exchequer's reference to electricity as one of the commodities the price of which would be controlled.

Replacement Appliances

THE Board of Trade has found it necessary to relax the operation of the Limitation of Supplies Orders to enable areas which have suffered damage from aerial attacks to recover as rapidly as possible. This has permitted replacement cookers and other electrical apparatus to be sent to the areas in good time and upon the whole has enabled the electrical service to be maintained at a satisfactory level. Our attention has been drawn, however, to an aspect of the subject which has caused some difficulties. We do not wish to score a cheap point, indeed we very deeply deplore the fact, but it is true that gas supply has proved much more vulnerable than electricity distribution, and interruptions of the service have at times been of long duration. This has led to a pressing demand in some areas for electrical appliances for emergency use in lieu of gas equipment, but while gas appliances can be freely supplied to replace gas appliances and electrical equipment to replace electrical equipment there is no relaxation of the Order to permit the replacement of one by the other, particularly if they have not been destroyed but just put out of service by failure of supply. This seems to be a matter which the Board of Trade should look into with a view to finding a remedy.

An Electrical Abattoir

Details of an Up-to-date Installation

Modern methods of stunning, handling, storing and conditioning at the new slaughter houses of the Scunthorpe Corporation are described

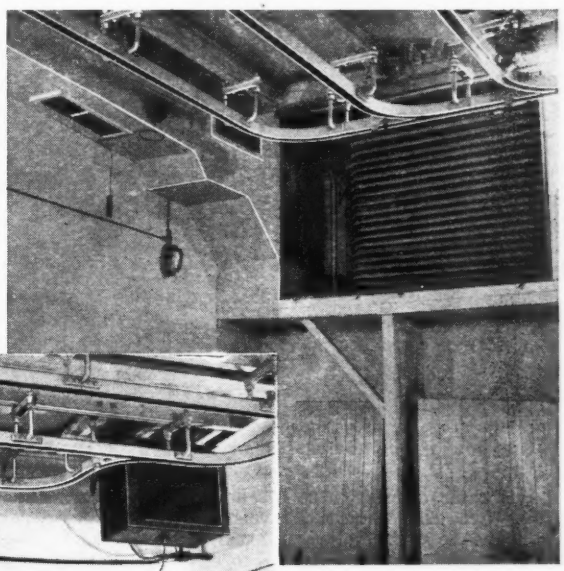
THE recently established abattoir of the Scunthorpe Corporation has been described by the Ministry of Food as the most up-to-date establishment of its kind in the country. By the courtesy of Mr. Gallagher, the abattoir superintendent, we were recently privileged to inspect the premises, with particular reference to the electrical installation and applications, so we can, for our part, vouch for a first-rate electrical installation and efficient methods of stunning, carcass handling, meat storage and cooling, and lighting.

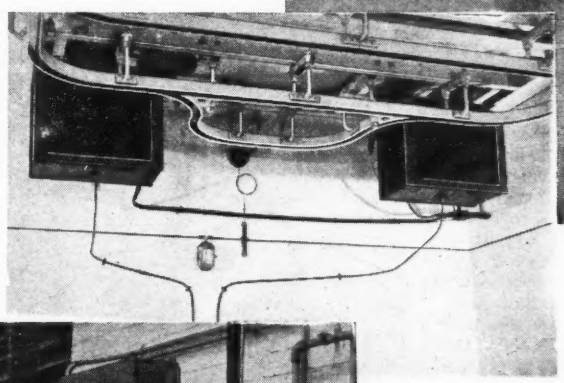
The abattoir may be visualised as a three-unit lay-out for dealing with beasts, sheep and pigs, and in each case the scheme provides for the continuous flow of the particular class of animal from the pens at one end of the premises, through the slaughter halls proper to the cold-storage and conditioning rooms at the other end of the building.

Actually, the main slaughter hall is common to both beasts and sheep, but the methods of slaughtering and handling are different and effected by quite separate equipment. All cattle first approach the abattoir by a drive which serves sorting-out pens in the open, from which the animals are passed on to other pens under cover, where they await delivery to the slaughter halls.

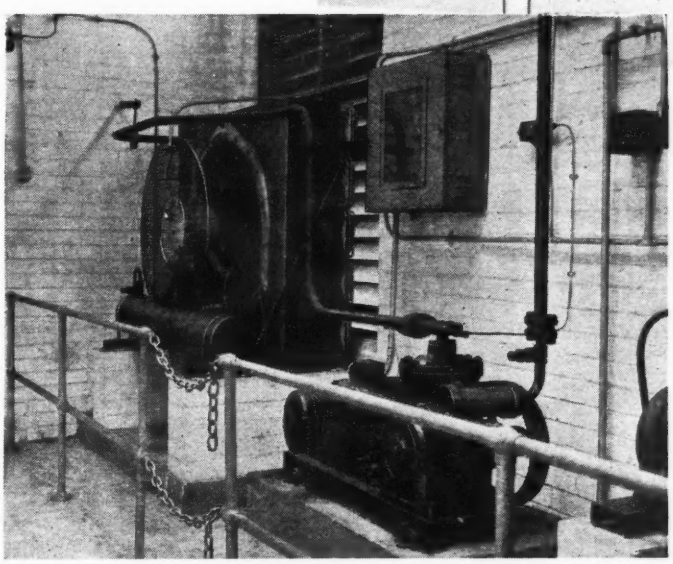
The beasts are passed up a short ramp communicating directly with a steel stunning pen rather like a horse box, and after each beast is stunned in this pen by a captive bolt pistol the bottom of the pen is lowered so that the unconscious beast rolls out on to the floor of the main slaughter hall.

It is then immediately shackled by one leg to the hook of one of four electric hoists operating on a circular overhead runway situated immediately above a bleeding pit. The beast is lifted and conveyed by the travelling hoist to the required point in the bleeding bay, and while in this position a main artery of the animal is cut and the blood is caught in a basin below from which it is drained away so that it can be sold for artificial manures. Each of the Morris hoists is equipped with a 1-HP 3-phase 440-V 1,440-RPM motor with gear transmission on to the hoisting drum. It is remotely controlled from near the floor level by means of a reversing switch at the lower end of a trailing cable. This switch has two running and stop positions.





Above : Evaporating unit and circulating fan in chilling room. Left : Self-contained cooling units in conditioning room. In each case thermostats and mercury switches are shown



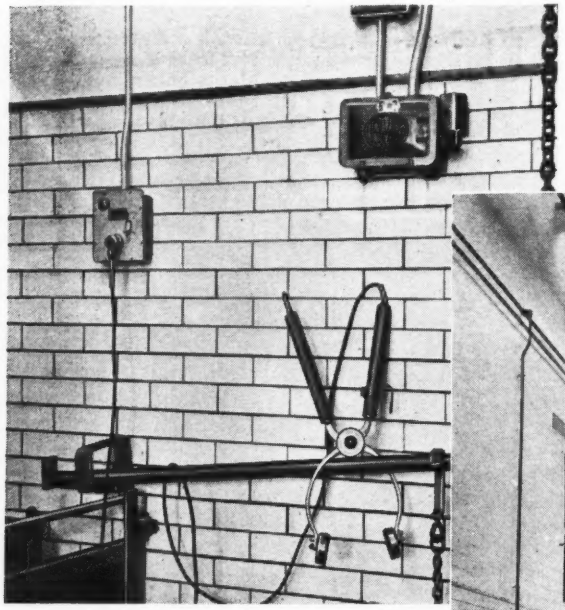
Conditioning room compressor and condenser showing motor contactor

After the bleeding operation the animal is passed on to a very extensive system of runways with hand-operated hoists by means of which it is transported to and from various points in the slaughter hall for dressing and splitting down. The hoisting system also communicates with a detention room where carcasses may be inspected, if necessary, and with an entirely separate room for condemned carcasses. Finally the carcasses are passed on to a conditioning room in which they are kept for the desirable short period of "priming" between killing and consumption, or the meat may be passed directly or subsequently to a chilling room for actual food preservation for an indefinite period.

The conditioning and chilling rooms each have a storage volume of 5,000 cu. ft., and in the chilling room the refrigerant from a compressor in the machine room is passed through automatic expansion valves from which it is delivered at low pressure to the tubes of the expansion or evaporation unit. By means of a motor-driven circulating fan, air is drawn from the room through ducts at one end of the room, passed over the cooling tubes of the evaporator and discharged through outlet ducts on the other side of the room.

In the conditioning room there are two evaporating units, each self-contained with its own circulating fan, and the air

passes in and out of the units direct. Access to both the conditioning and the chilling rooms is through double-door air-locks. In the engine room there are two twin-cylinder Lightfoot methylchloride compressor sets, one serving the conditioning room and driven by a 6-HP motor, while the other for the chilling room has an 8-HP drive. Transmission in each case is by short V-belt and the reduction is about 3 to 1 from the motor speed of 1,440 RPM.



The pig stunning pen, showing stunning tongs and special switch-plug unit

In the conditioning room a liquid-type thermostat operates at the limits of 46 and 48 deg. F., first actuating a mercury switch which, through automatic contactor gear, normally starts up or shuts down simultaneously the compressor motor, the circulating fan motors in the conditioning room and the fan motor of the condenser unit which is also in the engine room.

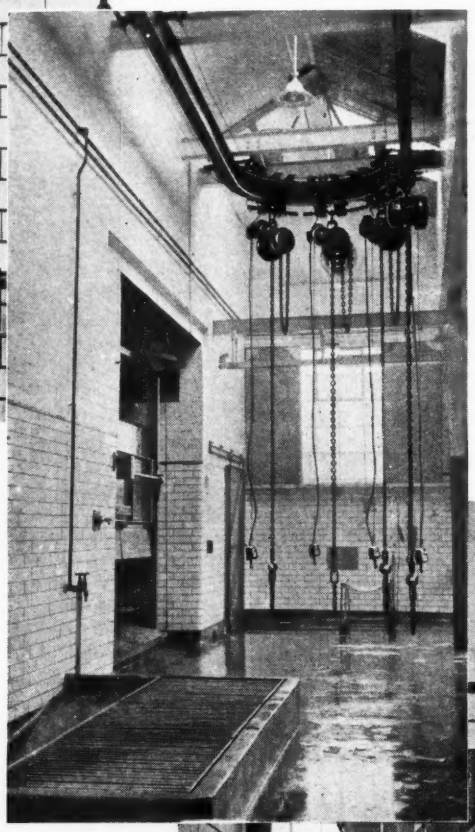
By means of a change-over switch the normal automatic running of all three units or groups—compressor, condenser and circulating fans—can be altered so that the circulating fans in the room are left running continuously on hand control while the compressor and condenser are shut down. The essential difference between the refrigerating room system and the scheme for the chilling room is one of temperature, the maintained air temperature in the chilling room being only 14 to 16 deg. F. Apart from this and the difference in the size of the compressors and the circulating system in the actual chilling room, as against the self-contained cooling units in the conditioning room, the equipment and controlling methods are similar.

The chilling and the conditioning rooms are used also for sheep and pig carcasses and need not, therefore, be referred to in detail again. Sheep enter the slaughter house from pens in much the same way as beasts, but instead of passing through a stunning pen they proceed directly to the main slaughter hall, where they are lifted on to "cratches"—ow galvanised-steel structures with cradle tops—and in these positions they are immediately stunned electrically. The stunning apparatus consists of a pair of tong-type electrodes with a single hand lever adjustment, so that the electrodes are easily applied with a grip behind the ears of the animal.

The stunning unit is supplied from two special plug units arranged on a 70-V (the stunning pressure) circuit from a 250/80-70-60-V tapping transformer at the central control and distribution point in the engineer's office. Each of the special switch-plug units is complete with an automatic thermal trip switch, watertight plug and pilot light. Bleeding is immediately effected on the cratches as is a certain amount of the dressing work. The remainder of the dressing is carried out on hoists in the main slaughter hall before the carcasses are passed to the conditioning and the chilling rooms.

For the pigs there is another set of pens with double-hinged gates which, as in the cases of the beast and sheep pens, serve to form a selective traffic system, ultimately leading to the stunning chamber. The application of the stunning electrodes to the pig requires both hands, so the apparatus is rather like a pair of long-handled garden shears, the electrodes replacing the blade cutters. Power at 70 V is also used for stunning the pigs, and the equipment and distribution arrangements are similar to those which we have already described in the case of sheep stunning.

Immediately the pig falls to the floor it is shackled by the leg and chain-hooked on to a special spiral elevator. This consists of a coarse worm shaft slightly inclined from the vertical and enclosed in a tubular housing having a slot lengthwise up the tube. The chain is hooked on to the worm thread where it is exposed at the tube slot, so that, bearing on the edge of the slot, the hook and hence the chain and the pig are carried upwards with the travel of the worm thread.



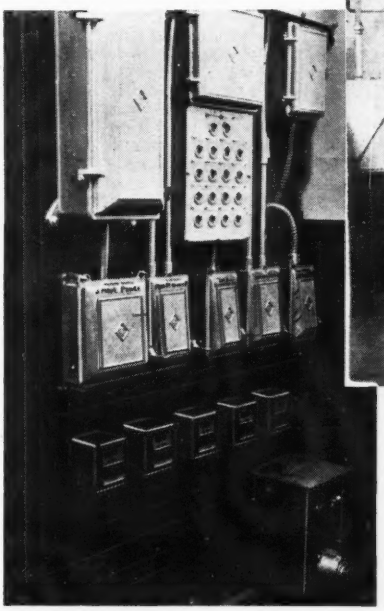
Main slaughter hall, showing stunning pen and electric hoists over bleeding pit

The spiral elevator in the pig stunning pen

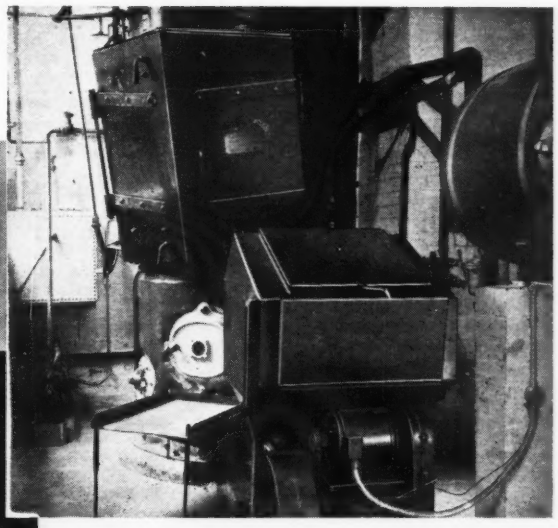
A 2½-HP motor at the top of the worm drives the latter through a very wide gear box. It is a squirrel cage Brook motor and is served by a star-delta starter.

At the top of the elevator the carcass passes on to a runway over a bleeding bay from which, after the appropriate treatment, it slides on rails to releasing points over scalding tanks where the animal is immersed and its hair removed after a pre-determined time. After further treatment on tables the pig is handled on hoists in the slaughter hall in much the same way as the cattle.

The scalding water at 150 deg. F. and water for general purposes throughout the abattoir are supplied through a directly-heated steam pipe and a calorifier, respectively, from a Brightside vertical boiler which is equipped with a Beaness automatically-operated mechanical stoker and fan: one motor drives both the stoker and the fan. The stoker consists of a worm which receives coal from a hopper above and passes it along its semi-trough housing to the fire bucket of the boiler furnace. Five speed changes are provided mechanically in the transmission gear from the 1-HP 1,440-RPM motor. A pressure-stat on the boiler cuts in and out at about 60 lb. per sq. in. and a float-switch controls the boiler water level. These both operate mercury switches which actuate the Allen West contactor gear serving the stoker motor. The boiler feed pump is also controlled automatically by the float switch. A time switch which can be set to operate the stoker motor for, say, 10 minutes for each hour during the night provides for maintenance of the boiler in a banking condition.



Central distribution and control equipment in engineer's office



The boiler, showing thermostatically-controlled mechanical stoker and fan motor; end of calorifier on right

A low-voltage three-phase supply is taken from the Scunthorpe electricity undertaking network at the engine room, where distribution is arranged for the conditioning and chilling rooms. From this point there is transmission direct to the engineer's office from which distribution is effected to the slaughter halls and there is centralised control for both power and lighting. Galvanised iron-clad Prentice equipment is used for the distribution and is mounted on an angle-iron framework, which also accommodates the tap-change transformer supplying the stunning circuits. This transformer is complete with a main switch, thermal tripping switch, pilot light and internal hand tap-changing arrangements.

While most of the wiring throughout the abattoir is by means of v.i.r. cable in screwed conduit, tough rubber-sheathed cable is used in the pens, the slaughter halls and in the conditioning and chilling rooms. The decision to use t.r.s. cables was made after a study of the conditions and experiences in other abattoirs throughout the country on account of the adverse effects of fumes.

Lighting Arrangements

Simplicity is the general keynote of the lighting system throughout the abattoir, and Wardle totally enclosed galvanised watertight fittings are used extensively. Nevertheless, the standard of illumination is high and averages about 10 ft.-candles at the working plane. Totally enclosed porcelain fittings are used in the pens and dressing rooms on account of ammonia fumes and again in the pig slaughter hall against the steamy atmosphere, while in the conditioning and chilling rooms are some excellent examples of watertight prismatic wall fittings. The lighting switching arrangements are generally simple, although a few special schemes include outside switching for the chilling room lighting, with a red "lights on" indicating signal lamp. Low-voltage push-buttons in the conditioning and chilling rooms communicate with a buzzer and indicators in the office and are a safeguard against someone being accidentally locked in either chamber.

The electrical scheme throughout was designed and executed by the Scunthorpe Corporation Electricity Department. We are indebted to Mr. J. Gallagher for permission to visit the abattoir and to Mr. F. Bray, the abattoir engineer, Mr. A. L. Boyle, A.M.I.E.E., borough electrical engineer, and Mr. H. Peace, A.M.I.E.E., chief assistant electrical engineer, for their help in collecting the information published in this article.

Conduit in New Zealand

Restrictions on Use to be Enforced]

UNDER the New Zealand Supply Control Emergency Regulations and the Building Emergency Regulations, the Building Controller has issued an order forbidding the use of screwed steel conduit for internal wiring in any case where an alternative method of enclosure or covering is provided for by the Electrical Wiring Regulations, 1935.

Exceptions are made in cases where there are inflammable or explosive gases; where corrosive fumes and liquids are present; in lift shafts where wiring is liable to mechanical damage; where there are service mains and unmetered circuits at special rates; in wet situations where it is impossible to make watertight joints or where hot liquids are likely to come into contact with the wiring; in unit drives for machines (*e.g.*, power in workshops, travelling cranes, etc.); and where heat-resisting cables are necessary.

In buildings of a permanent nature, where wooden casing and v.i.r. cables are used for ceiling runs, metal conduit may be used for drops to switches and heating points. This last clause is not to be interpreted as providing general permission for the use of metal conduits for drops in all buildings of a permanent nature. In certain installations conduit need not, and should not, be used.

The prohibition applies irrespective of whether the contractor had supplies on hand at the date of the order and to contracts accepted before that date in which metal conduit was specified.

Commenting on the order the *New Zealand Electrical Journal* says that in March, 1940, when it became apparent that metal conduit was likely to be in short supply, all electrical contractors were circularised, and the suggestion made that wherever possible wooden casing should be substituted for conduit. Many contractors adopted this suggestion. Information has been received, however, which indicates that the supply of conduit is likely to be greatly restricted and it is accordingly necessary that stocks which are already in the Dominion should be conserved and used for essential purposes only.

Conduit must be always readily available for urgent defence contracts, and also for use in the building industry in cases where it is not possible to use an alternative method of enclosure or covering.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions.

"Recent Testimonials"

I THINK that "Power Engineer" in your issue of April 25th raised an important question which employers would do well to consider. In my own case, when advertising vacancies, I do not specify that applicants should submit testimonials. I prefer to interrogate the candidates, in conjunction with the head of the section to which the candidate is to be appointed and then in the first place, to form my own judgment as to ability, etc.

A standard interview form is used with headings dealing with appearance, personality, likelihood of co-operation, initiative, etc., upon which the interviewers award their marks and thereby permit an average cross-section of opinion to be formed. It may, or may not, be necessary then to ask a candidate to submit testimonials, but this course need only apply to one or, at the most, two of the candidates on the short list.

I agree with your correspondent that the requirement by an employer of "three recent testimonials" is often absurd and that it would be much better to ask for the names of three referees to be given by applicants.

Norwich. J. A. SUMNER,
City Electrical Engineer.

New Prices for Goods

SOME manufacturers now are adopting a confusing method of advertising the new prices for their goods. One, in the ELECTRICAL REVIEW, quotes 15s. 6d. plus 33⅓ per cent., plus purchase tax, and one cannot easily say just what the selling price is, indeed errors may be made in the calculation sometimes. Another manufacturer gives more detail and shows that an article formerly costing £3 3s. 0d. now costs £5 5s. 0d.

It would be better if the full price was quoted right away. One retailer had a £25 radiogram for which he quoted six prospective purchasers £25 plus £6 war price, and they all rejected it because they did not want to pay £31 for a £25 article. He then altered the label to £31 and the next customer bought it without a word; it was an excellent set and he thought it a bargain. It would be well if all electrical suppliers followed suit.

Tynemouth. RETAILER.

Commutators and Brushgear

WITH reference to the criticisms of my article in the ELECTRICAL REVIEW of April 18th, I would like to mention that this and, in fact, all my maintenance articles, are based entirely on my own personal observation and experience gained over many years of maintenance work, and that these are an endeavour to place on record information which does not appear to be otherwise generally available.

There will undoubtedly be occasions when my conclusions will not meet with universal approval, but criticism is very welcome. Any information that is drawn will be very useful to maintenance men generally, and my articles will have served their purpose.

I do not propose to deal in detail with my critics. As I have mentioned previously, my conclusions are drawn from personal experience, and I do not propose to lightly discard them. I will willingly concede that there are numerous exceptions—I have encountered them myself—but I have endeavoured in my article to indicate the predominant conditions. Opinions from other maintenance men on these subjects would be welcome, for a little ventilation would do no harm.

Blackpool. JAMES E. NOBLE.

Fluorescent *versus* Gasfilled Lamps

I AGREE with Mr. G. V. Downer who, in his letter in your issue of April 25th, stated that he believed the closest approach to daylight could be achieved by means of gasfilled lamps correctly filtered, reflected and diffused. The "ability to see" is the only criterion by which we may surely judge lighting values. It is only by checking our reactions to the various possible forms of light that we may sensibly decide for ourselves what is good for us.

The light meter is useful for reading light values but the eye and sensitive nervous system form the only meter by which we may surely judge the quality of light.

The present-day methods are not fair or good methods. Powerful lamps, often backed by good reflectors, which only increase the glare obstruction to the eye, are seen in common daily use. The public are used by long training to this vile and insidious style of lighting. The lamp not only gives useful light but also through unchecked glare it is a source of damaging light to as much as 84 per cent. of its output.

All this has been pointed out in various ways and at various times in reports and articles in the ELECTRICAL REVIEW and elsewhere, but nothing has yet been done to really get moving in the battle against the ruinous glare to which we have been subjected too long.

In screening the glare area of various lamps I have had very good results which in practice have been responsible for much extra vitality and relief from nervous strain. The cost of the screening is trifling but the results are beyond doubt excellent.

The gasfilled lamp will stay and "ability to see" will be the only standard by which we shall judge when the powers that be really wake up. The fluorescent lamp is a luxury and as such it will be used once the screening of gasfilled lamps is put into general practice.

Barrow-in-Furness. R. CALDWELL.

Fluid Cable Insulation

THE first sentence of the article on this subject in your issue of April 25th is incorrect, as a cable has been produced using no impregnating compound in the dielectric, which consists of paper and an inert gas at high pressure.

Has the author considered the size of either a three-core, or single-core cable, for 100 kV and upwards using the suggested type of dielectric? I should be interested to witness the laying of cable consisting of steel conduit (particularly in a congested area). To obtain deviation either vertically or horizontally, would the author suggest heating the conduit or inserting the conductor and porcelain spreaders after laying? Jointing would also give rise to a number of queries. Would not the collection of occluded air be a difficult proceeding as the oil is circulating? I venture to point out that to be at the peak of insulation, oil must not contain occluded air.

The term "sludging" is not used in relation to cables, and so far as I am aware there is only one cable in which the viscosity of the oil is similar to that used in transformers and switchgear. Modern cables have a very infinitesimal amount of occluded air in the dielectric.

It seems to me that the author is confusing transformer technique with that of cables, which differ widely.

Grantham. H. W. ONGLEY.

N.S.W. Appliance Approval

SOME time ago we reported what was believed to be the first prosecution under the New South Wales law relating to the sale of electrical appliances. We have now received from Mr. C. J. Barnett, Acting Secretary of the Electricity Advisory Committee of the State, details of the scheme for the approval of appliances which has been in force for some time.

It is pointed out, however, that the system will be considerably altered as a result of an interstate conference held last year to consider means of bringing about uniformity of practice in the Australian States. The present system merely requires the applicant for approval to furnish a guarantee that the article complies with the published Standard Specifications; under the new arrangements an article submitted for approval will have to be submitted to an authority set up for the purpose of examining and testing appliances. We are assured by Mr. Barnett that the decision to abandon the existing system was made solely in the interests of uniformity.

The present arrangements provide that when an article is prescribed by means of a proclamation published in the Government Gazette it must be approved by the Electricity Advisory Committee before it may be sold, hired, exposed for sale or hire, etc. To receive approval an article must comply with certain specifications published by the Standards Association of Australia and must then be marked in one of the following ways: (1) It may be marked with the letters "P.S." followed by a registered guarantee number allotted by the Electricity Advisory Committee. (2) Certain letters and numbers authorised for use in Victoria have been recognised in New South Wales and authority has been given to stamp and label such letters and numbers on the article to indicate approval. (3) In the case of certain fittings approval may be indicated by the existence on the article of a trade mark or trade name which the Committee has permitted to be used.

The Committee has power to require any articles to be submitted for test before granting approval and also to revoke registered guarantee numbers for any of the following reasons: If the authorised person cannot be relied upon to carry out his undertaking that articles comply with the appropriate specifications; if misleading representations are made in advertisements or otherwise; if the articles do not comply with the specifications; if the authorised person fails to submit articles for examination and test when called upon to do so; and if the article concerned is likely to be, or to become, dangerous in use.

Open-Circuit Faults

Methods of Location in Feeder Cables

By W. Woodiwiss, A.M.I.E.E.

The author discusses the various types of faults of this kind, the appropriate way of dealing with them, the limitations of the various methods and the precautions to be taken

INCREASING capacity of generating and substation plant and cables is considerably increasing the kVA liberated at faults due to cable insulation breakdown. The result of this increase of available energy is a more frequent occurrence of open-circuit faults, in some cases the three cable cores being burnt through.

Before any attempt at localising a feeder fault can be made, it is necessary to know the type of fault—if it is an earth, a "short" or an open circuit ; and the character of the fault—that is, whether it is of high or low resistance, so that a measure of the voltage necessary for testing may be gained. It is also necessary to know the condition of the insulation of all three cores so that the testing set can be connected to those cores which will give the most accurate location.

All these facts are most conveniently represented in the analysis diagram shown in fig. 1 which is based on "Megger" readings taken on the cable at both ends. Three different possibilities of open-circuit faults on a three - core cable, requiring variations in the method of location, are illustrated. The basic principle is always that the capacity to earth of a cable core is directly proportional to the length of the core. Hence the capacity of length of faulty core measured from one end divided by the capacity of total length of core is equal to the length of fault from the measuring end divided by the total length of the cable, from which the position of the fault can be calculated.

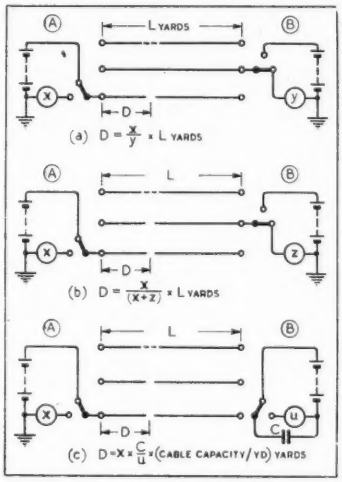


Fig. 1.—Tests with ballistic galvanometer

In the application shown of a ballistic galvanometer to locate the faults, the cable is charged to a given potential by the battery, and discharged to earth through the galvanometer ; the deflection of the galvanometer is a measure of the cable-core capacity. In fig. 1a one sound core is available throughout the entire cable length. The deflection on the faulty core is x, the deflection on the entire length of sound core is y, and the distance of the fault is given by x/y length of cable ; both tests are made most conveniently at the same end of the cable, but, for clarity are shown at opposite ends.

Fig 1b illustrates the case where only one partial length of core is available from each end, and from the deflections obtained at each end the position of the fault can be calculated by $[x/(x+z)] \times$ length of cable. Fig. 1c shows the worst type of open-circuit fault ; only one partial core is available at only one end, and it is impossible to calculate the fault position from the one galvo deflection obtained on this one core. If, in anticipation of this fault, a galvo reading on an entire core has been taken prior to putting the cable into commission, and the reading logged on a label tied to the cable end, the location calculation can be simply made as in fig. 1a.

If the galvo deflection for a sound core is not known, one method of location is to take the galvo deflection on a sound cable of a similar type-size and construction to the faulty cable. If the length of this sound cable is L_s yards, and the galvo deflection is x_s then the position of the fault is given by $(L_s/x_s) \times x$ yards. If a sound similar cable is not available, the location must be carried out by taking the galvo deflection on a condenser of known capacity—say C microfarads. If the deflection on the condenser is u, then the fault position is calculated from the formula : $(C/u) \times x \times$ (Cable-core capacity to earth and other cores in μF per yd.) The data for cable capacities is not available in the majority of reference books, and search for these figures during a breakdown is likely to prove disconcerting.

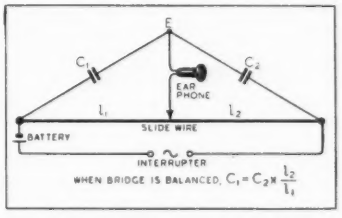


Fig. 2.—Simple capacity bridge

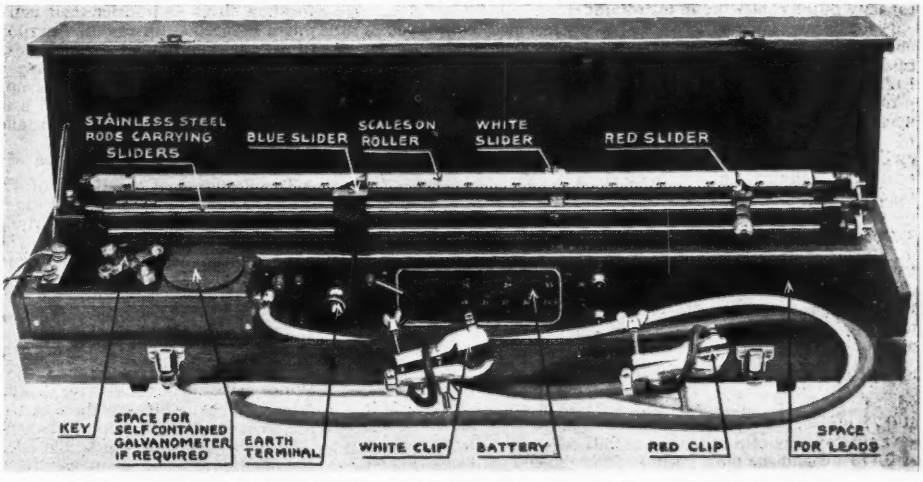
In galvo tests it is advisable to connect the battery positive to the faulty core ; the negative is liable to attract moisture and the lowered insulation resistance impairs the accuracy of the test. A heavily damped galvo, since its swing is not a true measure of capacity, will not give accurate location. The galvo test necessitates the taking of a "spot" reading to be taken.

If there is a possible error of observation of one division, the percentage error is less if measured on one hundred divisions than on ten divisions and the galvo should be put on to the shunt power that gives the maximum deflection.

Slide-wire Test

The galvo test gives a simple method of location, and, when the insulation resistance of the faulty core is high, gives accurate location. Low insulation resistance of the faulty core allows the flow of leakage currents which make accurate measurement of capacity impossible by this method.

The slide-wire capacity bridge, which is similar in principle and manipulation to the Murray loop slide-wire bridge for locating "shorts" and "earths," can be employed for locating open circuits and will give useful results where the galvo test fails. The basic principle is illustrated in fig. 2. A pulsating supply, obtained



Direct reading slide-wire bridge with three sliding contacts. (Price & Belsham)

from a battery-interrupter, is fed into the ends of the slide wire. The two condensers are connected in series across the slide wire ; the common terminal of these is connected to one side of a microphone, the other side of which is connected to the sliding contact. The slider is moved along the wire until no sound is heard in the phone, then, $(C_1/C_2)=(l_2/l_1)$.

In fig. 3 this bridge is applied to the faults previously located by the galvo tests. The fault position is determined by a comparison of the cable-core capacities. Fig. 3a shows one entire core length connected to one side of the bridge and a partial core connected to the other side ; these cores have each a capacity to the cable sheath which is connected through the phone to the slide wire. When the sliding contact reaches the point of silence, then, since the slide wire is one thousand units in length,

$x \times$ (capacity of the entire cable core) $= (1000-x) \times$ capacity of partial core ; or

$$\text{capacity of partial core} = \frac{x \times \text{(capacity of entire core)}}{(1000 - x)}$$

or

$$\text{length of partial core} = \frac{x \times \text{(length of entire core)}}{(1000 - x)}$$

Figs. 3b and 3c illustrate the application of the bridge to locate the open circuit faults when (1) two partial cores are available ; (2) when only one partial core is available : the formulæ can be developed similarly to that for fig. 3a.

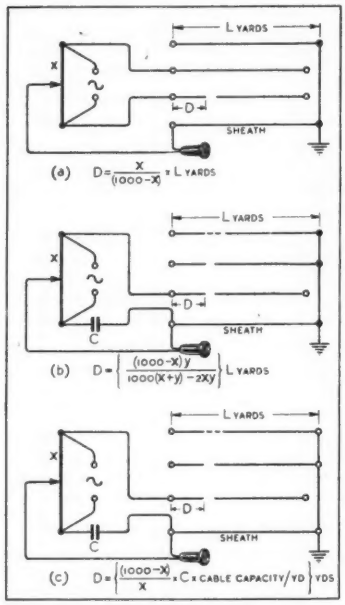


Fig. 3.—Tests for open-circuit faults by slide-wire bridge

The outstanding meritorious feature of the capacity bridge is its accurate location of low-resistance faults ; this is made possible by a compensating resistance which is connected into the circuit to balance the fault resistance. Fig. 4 illustrates one arrangement of a compensated bridge. R_1 is the compensating resistance connected in shunt across a variable condenser, C_1, which balances against the capacity of the cable core. R_2 is a shunt resistance connected across the core capacity and the cable sheath. R_3 and R_4 are two equal resistances. The bridge is balanced by adjustment of R_1 and C_1, and the indicator on C_1 gives the capacity of the cable core in microfarads.

In the above examples it has been tacitly assumed that the cables under test were of a uniform type and size. Where this is not the case compensation will have to be made in a manner similar to those made when making a Murray loop test on cables of different resistance. Taking, for example, a faulty cable of which 400 yd. has a capacity of 0·25 μF per 1000 yd. and 600 yd. has a capacity of 0.125 μF per 1000 yd. to calculate the fault position, a reduction must be made to a common capacity basis. Working on a 0.25 μF basis, 600 yd of 0.125 μF cable is equivalent to $\frac{600 \times 0.125}{0.25} = 300$ yd. of 0.25 μF cable and the equivalent length of the cable at 0.25 μF $= (300 + 400) = 700$ yd. Testing from the 0.25 cable gave the capacity of partial core as 0.05 μF and of the entire core as 0.175 μF and the fault position from the end of the 0.25 cable as $\frac{0.05 \times 700}{0.175} = 200$ yd.

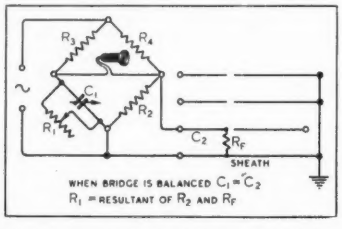


Fig. 4.—Compensated capacity bridge

It is essential that the conductors not included in the capacity test should be bonded to earth at each end of the cable ; if this is not taken care of errors of as much as 7 or 8 per cent. may be introduced.

Industrial Premises

Registration and Control

As a logical outcome of the Concentration of Production, the President of the Board of Trade recently set up the Control of Factory and Storage Premises, with Sir Cecil Weir as Controller-General, to centralise and co-ordinate the allocation of accommodation to Government Departments. It is now announced that Sir Cecil will be assisted at the headquarters organisation by Sir Thomas Barlow as deputy controller-general and Mr. Philip A. Warter as storage controller.

Regional controllers have also been appointed to the Civil Defence Regions, and they will work in close co-operation with the Area Boards and with the regional and local representatives of Government Departments. There will be for the present at headquarters a regional co-ordinator (Mr. Sadler Forster) who will act as a link between headquarters and the regional organisation and, where necessary, will be available to assist regional controllers in areas that have suffered from aid raids.

Explaining the operation of the Control a few days ago, Sir Cecil Weir said that the date on which it would begin to function would be announced later. After that date all Departments would have to obtain the approval of the Control, through the regional controllers, before acquiring factory or storage premises. The actual requisitioning or leasing would be carried out as at present by the Service Departments or the Ministry of Works and Buildings as the case might be, after approval by the Control.

Compilation of Register

A register of factory and storage premises was being compiled, and a questionnaire was being sent to all factories normally employing ten or more persons except those wholly or mainly engaged in the engineering and munition industries and in the list of trades included in Group I of Part II (Protected Establishments) of the Schedule of Reserved Occupations and Protected Work. Owners or occupiers of factories outside the excepted classes who did not receive a copy of the questionnaire within the next few days, and occupiers of factories normally engaged in the excepted trades referred to above who were not fully occupied on Government work, were asked to assist the Control by obtaining a form of return either from their local Chamber of Commerce, the offices of the Federation of British Industries, the National Union of Manufacturers, or direct from the Registrar of Factory and Storage Premises, Board of Trade, Millbank, London, S.W.1.

It was hoped that the section of the register dealing with factory premises would be ready by the end of this month. The register would show which premises could most readily be made available for other purposes without detriment to other important work or to employment and the purpose for which they were most conveniently and suitably equipped. The storage section of the registrar, which would cover premises of 3,000 sq. ft. and over, would also be compiled without delay.

The operation of the Control would affect the acquisition of factory and storage premises by private interests as well as by Government Departments. As announced by the President in the House of Commons, the pressure on factory and storage space due to the expansion of the war effort, made it impossible to allow firms to transfer their activities to new premises which might be needed for essential purposes unless there were reasons of national importance to justify this. An Order was being issued to prevent unregulated movement by making transfers to new premises generally subject to the approval of the Control. This would also minimise the risk of a firm finding its new premises requisitioned as soon as it was installed in them.

Concentration of Industry

The President of the Board of Trade announced last week in the House of Commons that it was necessary to set a limit to the period within which voluntary arrangements for concentration of production could be submitted. The latest dates for submission of voluntary schemes for the plastic industries is May 24th. Other dates will be announced later.

There has been some misunderstanding about the position of the small firms. Arrangements between small firms are welcomed and are considered on exactly the same basis as arrangements between large ones. But large and small firms alike not making these arrangements will have to face certain consequences. Their labour will in many cases have to be taken for munitions or for the armed forces; wherever there is a shortage of raw materials its preferential allocation to nucleus firms and firms grouped with them will mean that the whole effect of this shortage is felt by the other firms; and, consequently, the policy of the Government will be to direct requisitioning to their premises. The difficulties attending a forced concentration of a large number of very small firms are very great, and where these arrangements are not made on a voluntary basis, those that have not been concentrated will have to stand the burden of decreasing turnover without the compensating advantages of concentration.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AN Engineering Advisory Committee has been appointed by the Lord President of the Council to advise the Government upon engineering questions related to the war. The chairman is Lord Hankey, Chancellor of the Duchy of Lancaster, and Lord Falmouth, Companion I.E.E., is vice-chairman. The members are as follows :—Sir Henry Tizard, F.R.S., Mr. J. R. Beard, President I.E.E., Dr. A. P. M. Fleming, past-president, I.E.E.,, C.DrC. Paterson, past-president, I.E.E., Mr. W. T. Halcrow, M.Inst. C.E., Mr. B. W. Holman, A.R.S.M., Mr. H. R. Ricardo, F.R.S., and Principal A. Robertson, F.R.S.

Dr. C. C. Paterson, Mr. J. R. Beard and Dr. A. P. M. Fleming, three members of the Government's Engineering Advisory Committee

The committee's functions will include the consideration of the best utilisation of the engineering profession in connection with war work and the nomination of engineers for particular tasks. It will also suggest means of improving the methods adopted by Government Departments for utilising engineering science for war purposes and advise on the development of new engineering devices and means of bringing them into rapid production.

A further duty will be the examination of new devices or ideas likely to assist the war effort and to bring to the notice of the Government those which appear to merit further consideration.

Government Changes.—It was announced last week that Lord Beaverbrook had been appointed Minister of State and that his place as Minister of Aircraft Production had been taken by Lt.-Col. J. T. C. Moore-Brabazon, Minister of Transport. The Ministries of Shipping and Transport are being combined under Mr. F. J. Leathers who is being raised to the peerage. Lt.-Col. J. J. Llewellin has been appointed Parliamentary Secretary to the Ministry of Transport and will represent this department and the Ministry of Shipping pending the amalgamation of the two Ministries. Mr. Fred Montague has been appointed Parliamentary Secretary to the Ministry of Aircraft Production.

Mr. F. J. Leathers

Mr. F. C. Stewart, who has been elected president of the Institution of Engineers and Shipbuilders in Scotland, is chairman of Thermotank, Ltd., Thermotank Engineering Co., and of Kelvin, Bottomley & Baird.

Mr. H. W. H. Richards, who as we reported in our last issue, has been appointed chief electrical engineer of the London and North Eastern Railway, joined the company in 1924. Born at Bristol in 1886, Mr. Richards was educated at Bradfield College, Berks, and received his training at Faraday House. In 1909 he became assistant engineer to Kincaid, Waller, Manville & Dawson, and two years later took up an appointment as assistant engineer to the A.E.G. In 1913 he joined the London, Brighton and South Coast Railway as electric traction engineer with whom he remained until 1924 when he was appointed electrical engineer to the L.N.E.R. Mr. Richards holds the Faraday House Diploma (gold medal), is a member of the Institutions of Civil, Mechanical and Electrical Engineers, and is also a member of the Institutes of Transport and Locomotive Engineers. He is the holder of the Telford Gold Medal, the George Stephenson Gold Medal and the Watt Prize awarded by the Institution of Civil Engineers for papers read and discussed.

Mr. E. Thompson, chief mechanical engineer to the L.N.E.R., was educated at Marlborough and Pembroke College, Cambridge. He holds the degree of B.A. He was a pupil with Beyer Peacock & Co. Ltd., and subsequently joined the Midland Railway, later going to the Royal Ordnance Factory, Woolwich, as supervisor. He joined the N.E.R. in 1906 and has held various positions since that time. He visited America with the late Sir Vincent Raven in connection with railway electrification.

According to the *Madras Mail* a new post of Electrical Commissioner with the Government of India has been created and **Mr. H. M. Mathews** has been appointed to the post. A Press note says: "An efficient and adequate supply of electrical energy is essential to war production, and the Ministry of Supply Mission to India recommended the appointment of an Electrical Commissioner whose duty it would be to ensure that the efficiency of electric supply undertakings in India is maintained and that ordnance factories, and other factories engaged on important war work, have their electrical systems so arranged as to be reliable and secure, and also receive the supplies of energy that they require."

Mr. J. Rowan relinquished his office as general secretary of the Electrical Trades Union on April 30th, a position which he had held since 1907. He joined the organisation in 1897 and has held office in the Union since 1898, being elected national organiser in 1904. When the National Joint Industrial Council for the Electricity Supply Industry was formed in 1919, Mr. Rowan became its first vice-chairman ; he was also associated with other Joint Industrial Councils and allied trade union movements. His services are being retained until the end of the year as counsellor and advisor.

Mr. E. W. Bussey, who succeeds Mr. Rowan as general secretary of the E.T.U., has long been connected with the supply side of the industry. For many years he was employed by the L.C.C. as a substation engineer. It was on his initiative that the Union adopted and carried through the reorganisation scheme of 1929 which basically transformed the Union's structure.

Mr. E. W. Bussey

On the removal of the general offices of the Union from Manchester to London, in 1930, Mr. Bussey was elected general president in succession to Mr. J. W. Ball, a position which he has held ever since. In addition to these duties, he has also been chairman in alternate years of the National Joint Industrial Council for the Electrical Contracting Industry, one of the Union's representatives on the Confederation of Engineering and Shipbuilding Trades, the London Transport Joint Trades Committee, and chairman of the London Transport Power Group (Trams and Trolleybuses) Joint Shop Stewards' Committee.

Mr. H. de A. Donisthorpe has sent us the following copy of a cablegram received from Mr. D. Sarnoff, President of the Radio Corporation of America, at the annual meeting of the British Radio Industries Club on April 30th :—"Each year since Marconi's first wireless message from England to America forty years ago radio has strengthened bonds of friendship between our countries, to-day it carries cordial and affectionate greetings to British Radio Industries Club and best wishes for success of annual general meeting this year, next year and many years to come.—David Sarnoff."

Mr. F. Barrell, A.M.I.E.E., A.M.I.Mech.E., chief engineering assistant to the Poplar Borough Council electricity undertaking, has been appointed deputy electrical engineer to the Blackburn Corporation, under Mr. R. H. Harral. Mr. Barrell was born at Oldham and received his technical education at Oldham Technical School, Manchester College of Technology, Birmingham Technical School and Woolwich Polytechnic. He received his early training with J. P. Halls, of Oldham, and the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park.

Mr. F. Barrell

From 1924 to 1928 he was assistant to the late Mr. A. E. Angold in the Development Department of the General Electric Co., Ltd., Witton, Birmingham, and subsequently he became designing engineer with that company, specialising in automatic plant and schemes. Mr. Barrell joined the Poplar Electricity Department in 1935 as superintendent of substations, becoming chief engineering assistant in 1939.

Alderman Sir Percival Bower, who was married recently, has received a silver salver as a wedding present from members of the Birmingham Electric Supply Committee, of which he is chairman.

Mr. A. E. Cunningham has been nominated for the chairmanship of the North Midland Students' Section of the Institution of Electrical Engineers for the session 1941–42.

Mr. J. Wood, C.M.G., M.Inst.C.E., M.N.Z.I.E., has, according to the *New Zealand Electrical Journal*, retired from the position of Engineer-in-Chief and Under-Secretary of the N.Z. Public Works Department. Mr. Wood joined the Department in 1900 and in 1904 became an assistant engineer. In the following year he was appointed acting-resident engineer, Nelson, and in 1906 he took charge of the survey of the Lake Coleridge hydro-electric scheme. After holding other positions with the Department he became Assistant Engineer-in-Chief in 1933, and was appointed permanent head, with the designation of Engineer-in-Chief and Under-Secretary in 1936.

Mr. F. T. M. Kissel, the New Zealand Electricity Controller, has been appointed Dominion Lighting Controller and will administer, under the direction of the Minister of National Service, new lighting regulations.

Mr. R. D. Veitch has succeeded the late Mr. A. E. A. Watkins as electrical engineer to the Timaru (N.Z.) Council. He had previously been engineer to the South Canterbury Electric Power Board.

Mr. A. E. Dyment retired as chairman of the board of directors at the annual meeting of Canadian General Electric Co., Ltd., in Toronto, on March 24th, and **Mr. D. C. Durland,** president of the company, has assumed the additional position of chairman. Mr. Dyment retains his seat on the board. **Mr. S. Hass** has retired as vice-president, remaining on the board, and **Mr. J. J. Ashworth** has retired from the directorate.

In a written reply, Mr. Butler, Under Foreign Secretary, states that **Dr. C. G. Darwin,** Director of the National Physical Laboratory, has been sent to America by the Government in connection with the scheme for co-operation in scientific matters with the United States.

Dr. Darwin will be director of a central scientific office, working under the direction of the British Supply Council in North America. He will collaborate with United States research bodies, to act as a channel for the exchange of technical and scientific information and generally to co-ordinate such inquiries to and from United States authorities.

Mr. F. L. Harris, switchboard attendant, Roath power station, Cardiff Corporation, has been appointed control engineer, Central Electricity Board, Bristol.

The Controller of Machine Tools has appointed **Mr. S. F. Steward** as electrical adviser in charge of a branch of the Control to give advice and direction on all matters connected with electrical equipment for machine tools.

At the adjourned annual general meeting of the Salisbury Electric Light and Supply Co., Ltd., it was stated that **Mr. C. H. Jones** had resigned from the board, to which he was elected in 1927.

Mr. E. F. Dadson has been appointed to the boards of the Shropshire, Worcestershire and Staffordshire Electric Power Co. and the Wessex Electricity Co., Ltd.

The Southwark Borough Council Electricity Committee has recommended the appointment of **Mr. C. Spencer Brooks,** principal technical assistant to the Nuneaton Corporation Electricity Department as deputy electrical engineer at a salary of £668 per annum.

Obituary

We regret to learn of the death recently, through enemy action, of Messrs. **R. E. Battersby,** chief engineer, and **H. A. Sharratt,** accountant, of Messrs. Lee, Beesley & Co., Ltd., electrical installation engineers, Coventry.

Mr. John Caldwell, aged sixty-five, superintendent for the Canadian General Electric Co., died on March 30th, at his home in Toronto. Mr. Caldwell was superintendent of construction of pen-stocks and spiral casing in connection with the Queenston Power Development, and he had been at the company's Davenport works since the end of the last war. Born in Glasgow, he was the son of an engineer and received his education in the Alan Glen School and the West of Scotland Technical College. He went to Canada in 1906.

The late Mr. R. Hornby

Mr. Robert Hornby.—The death is reported, on April 28th, of Mr. Robert Hornby, founder and managing director of Robert Hornby & Co., Ltd.

Will.—The late **Mr. P. H. Naftel,** A.M.I.E.E., formerly chief inspector, Liverpool Corporation Electricity Dept., who died in January aged 81, left estate valued at £4,428 (net personalty £3,805).

NEW BOOKS

Power Station Design. The 1941 "Kempe."

Electric Power Stations, Vol. I. By T. H. Carr, M.A.Min.E.E., A.M.I.M.E., A.M.I.E.E. Pp. 376; figs. 165. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 30s.

This book deals with the design, layout, construction and operation of steam electric power stations. In his introductory remarks, the author gives a table showing the best results achieved in coal consumption and thermal efficiency from 1918 to 1938. We would suggest that the values given for 1918 and 1921, namely, 3.47 lb. and 1.70 lb. as the lowest station coal consumptions, are seriously in error.

Carville B started to operate about 1915 and achieved a coal consumption of about 1.7 lb. North Tees started to operate about 1921 and achieved a coal consumption of about 1.4 to 1.5 lbs. Great increases in thermal efficiency have been made in the period covered by the table, but not so great as shown, for the race for thermal efficiency had started much earlier than the author apparently realises.

The present volume covers fundamentals of station design, civil engineering works, circulating systems, cooling towers, coal handling, ash handling, boilers, pipework and turbines. Volume 2 will deal with the remaining sections of plant. The author has given a comprehensive review of modern practice in power station design, which will interest all associated with stations. The bibliographies given at the end of each chapter will enable those interested to study further the particular work which interests them.—J. N. W.

Steam Power Stations. By Gustav A. Gaffert, Sc.D. Second edition. Pp. 582; figs. 379. McGraw-Hill Publishing Co., Ltd., Aldwych House, London, W.C.2. Price 31s. 6d.

This is a book based in practice in the U.S.A. The author has had teaching experience in heat-power engineering, and also power station design experience as a mechanical engineer on the staff of consultants. The influence of the former profession is seen in the treatment of fundamental physical laws affecting design, which are expounded clearly throughout. The subject is treated mainly from a design and construction point of view of the mechanical engineering equipment of power stations, and is intended to be of assistance to college students taking up power engineering as a profession, and also to practical men who have not had the advantage of adequate technical training. There appears to be a larger field among the latter in the U.S.A. than in this country.

The book is arranged in twenty-six chapters, in a logical sequence, each dealing with a section of power station equipment. The fundamental physical laws and theoretical considerations which influence design and performance are first examined, and then a clear indication is given of what modern practice has settled down to. A bibliography is given on the particular section covered at the end of each chapter, which will enable the student to pursue his studies further in any particular section.

The volume does not deal with structural and electrical matters, but confines itself solely to what may be termed the steam side of power stations. Within its self-imposed limits, the book will be of assistance to those for whom it has been written.—J. N. W.

The Technology of Magnesium and its Alloys. Compiled by A. Beck, and translated by the technical staffs of F. A. Hughes & Co., Ltd., and Magnesium Elektron, Ltd. Pp. 512, figs. 524. F. A. Hughes & Co., Ltd., Abbey House, London, N.W.1. Price 30s.

Magnesium has long been used in pyrotechnics. In 1909 magnesium alloys of specific gravity 1.8 were introduced as constructional materials. Their progress, slow at first, was hastened during the 1914–18 war and by 1939 world production of magnesium was well over 30,000 tons per annum. Since then, war requirements have called forth a further large increase in production. The I.G. Farbenindustrie for many years led the way not only in production but also in the technical development of magnesium and its alloys. With this development were closely associated the eighteen or so authors of the German book. This comprehensive and authoritative treatise has been admirably translated by a similarly qualified group in this country. A foreword by Dr. D. R. Pye refers to the importance for the aircraft industry of magnesium alloys, combining extreme lightness in weight with good strength and other desirable properties.

In the established method of production magnesia is converted into anhydrous magnesium chloride from which magnesium is extracted by electrolysis of the fused salt, but thermal reduction of the oxide by carbon, silicon or aluminium is now beginning to rival the electrolytic method. Pure magnesium, relatively weak, can be greatly strengthened by the addition of up to 10 per cent. aluminium. Zinc, silicon and manganese are also useful alloying elements. The magnesium alloys are used as sand castings and die-castings, and in the form of rolled, forged or extruded material. The abundance of the natural sources, the development of processes of production and manufacture and the excellent properties attainable promise a great future for magnesium alloys.

No aspect of their technology is overlooked in this book. Sections by different authors deal with raw materials and production, properties of magnesium single crystals, metallography (including a thorough treatment of the binary and ternary systems of industrial importance), physical and mechanical properties, corrosion and surface protection, melting and casting, die-casting, extrusion, forging, rolling, machining, and other sides of the subject. A summary of the extensive patent literature completes the book, which will be indispensable to all concerned in its subject. The translators comment caustically on the German bias of the original book and have endeavoured to correct this where possible.—H.M.

Kempe's Engineers' Year-Book, 1941. Pp. 2778; illustrated. Morgan Brothers (Publishers), Ltd., 28, Essex Street, Strand, London, W.C.2. Price 35s.

It is not easy to criticise such an old and tried friend as Kempe's, particularly in these days when the mere production of such a monster volume is a highly creditable achievement. For some years, however, we have grown increasingly concerned about what we think is a lack of touch with modern electrical developments. True, we may not have been successful each time in finding what we have looked for, because much important electrical engineering matter is to be found within the 2,600-odd pages outside the 142-page section on Electrical Engineering.

Our greatest concern, however, is about such things as the scanty treatment of electric furnaces in the section on "Metallurgy," of the technique of high-speed driving in the section on "Machine Tools," and of the modern space heating methods in both the "Electrical Engineering" and "Heating" sections. What about the advances in "electrical heat treatment" which have meant so much to the metallurgical world, the extremely exacting conditions so successfully met by the modern machine-tool motor, and the proven advance of electric space heating beyond the older "occasional use" idea?

We hope to see more attention given to these matters in future issues.—P. W. T.

Shorter Notices

Drawing and Developing for Practical Welding. By F. W. Sykes. Pp. 72; figs. 71. Price 4s. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2.

Electrical Engineering Laboratory Experiments. By C. W. Ricker and Carlton E. Tucker. Fourth edition. Pp. 458; illus. Price 12s. **Troubles of Electrical Equipment.** By H. E. Stafford. Pp. 373; figs. 330. Second edition. Price 21s. McGraw-Hill Publishing Co., Ltd., Aldwych House, London, W.C.2.

Principles of Direct Current Machines. By Alexander S. Langsdorf. Fifth edition. Pp. 746; illus. McGraw-Hill Publishing Co., Ltd.

Steam Turbine Principles and Practice. By Terrell Croft. Revised by S. A. Tucker. Pp. 298; figs. 244. McGraw-Hill Publishing Co., Ltd. Price 21s.

Mechanical Vibrations. By J. P. Den Hartog. Second edition. Pp. 448; figs. 282. McGraw-Hill Publishing Co., Ltd. Price 35s.

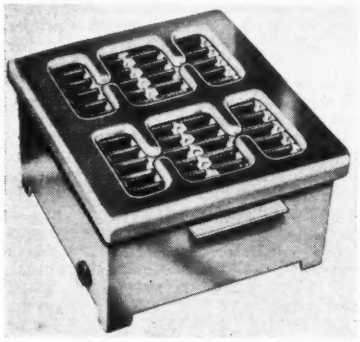
RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Utility Boiling Plate

An inexpensive boiling plate, the latest to be introduced by the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1, is described as a utility heater, since a projecting "foot" is provided for tilting sideways to enable the open top to serve as a fire, or for toasting and frying, apart from being large enough to accommodate three saucepans for boiling.

It is strongly constructed of cast-iron and sheet metal, finished in art silver; 9.5 in. long, 8.5 in. wide and 5 in. high. The loading is 1,200 W and a switch can be added to control 600 W for half heat.

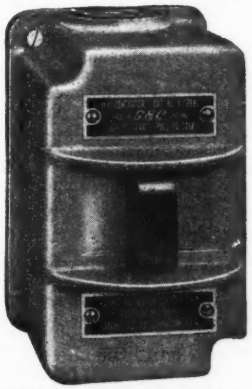


Dual-purpose boiling plate

Protective Motor Starter

Although the driving of small auxiliary machines by individual motors of less than 1 HP instead of from lineshafts is increasing, consideration is not often given to the isolation of the motor in the event of supply interruption. The additional cost that such a safeguard may entail is not commensurate with the risks of omission, since without protection accidents are likely to occur when the supply is restored to the motor "standing" connected to the line.

To preclude the possibility of such occurences the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has introduced a starter for miniature single-phase motors. It is an ironclad two-pole contactor with two breaks per pole. A knob on the front of the case mechanically closes the contactor, which is then held in position by its operating coil and has, in consequence, inherent low-volt protection. Should the supply fail the coil will become inoperative and the contactor will open. In addition this starter can be used for remote operation by push-button, or by pilot switches, and other features are the neat bakelite mouldings used for the base and moving parts and the facility with which the contacts can be removed for renewal. The rating is 1 HP at 50 cycles, or 10A as a contactor, both at 200/250 V.



Protective starter for small single-phase motors

Spring Closure of Switches

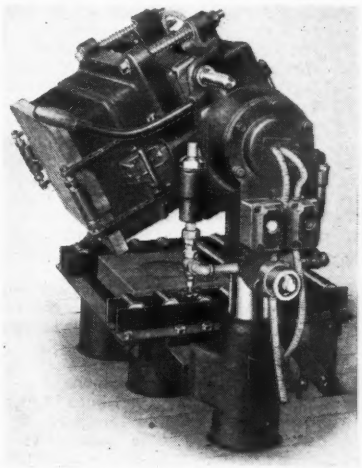
For closing from a distance circuit-breakers rated in excess of 10,000 A symmetrical, or 150 mVA three-phase, either electrical solenoid or spring mechanism is offered by J. G. STATTER & CO., LTD., 82, Victoria Street, Westminster, London, S.W.1. In the mechanical case closure is effected with the aid of four helical springs acting at the corners of a rectangular steel plate which is compressed by a screw-down handwheel on top. At the limit of travel a system of toggles takes up such a position as to be almost in line, when a pin made integral with the toggles engages with a catch. When the latter is released by a lanyard cord projecting from the front the sprung plate moves levers, which actuate steel quadrants with cut teeth geared directly to a shaft that rotates the breaker.

There are two links and two geared quadrants with two gear wheels to ensure that the action is balanced, with cushioning dashpots and buffers. When the springs have been latched home, which can be accomplished within approximately one minute, the screw-down portion may be withdrawn or left in any position without risk of damage. Visual indicators are provided and all working parts are enclosed in dustproof cases.

For use in emergency a closing handle of the ratchet type engages directly with the shaft, merely moving the actuating pin of the geared quadrants in a slot, without interfering with the spring mechanism. It will not open the switch, for which purpose there is a trip lever on one side of the casing. Alternative to normal pull-cord closing is a voltage trip coil with remote push-buttons, or other equivalents, including means of self re-closing.

Magnetic Moulding

To the range of "push-button" magnetic moulding machines made for metal foundries by BRITISH INSULATED CABLES, LTD., Prescot, Lancs., there has lately been added a "roll-over" type whereby the squeezing and vibrating as well as the heating are performed electrically, so reducing cost, while maintenance is also lessened because of the elimination of pipe lines and glands and packing.



Magnetic "press-button" moulding machine in "roll-over" position

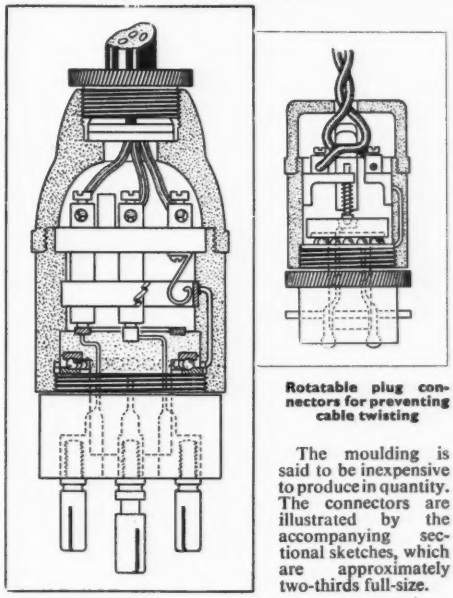
With the pattern plate in position within the frame (downsand method) on which the moulding box is placed and filled with sand, the bottom board is secured by clamps to enable the machine table to "rolled-over" through 180 degrees (as illustrated) by pulling a hand lever. Distortion of the mould is avoided because rotation precedes the squeezing, which is effected by depressing a push-button. Releasing the button frees the clamps so that the mould is automatically stripped and landed on the roller conveyor, thus conserving the operator's energy. Pressing another button subjects the mould to vibration during the stripping period.

Novel Plug Connectors

RESTRICTION of mobility which results from the twisting and tangling of flexible leads and cables employed for connecting all kinds of portable appliances, tools, instrument panels, movable lamps, etc., can be avoided by utilising rotary coupling devices patented by Mr. Beales Lee, 35, Bandon Rise, Wallington, Surrey.

These connectors incorporate a cord grip feature and can be made either for permanent attachment, or detachable for plug-in, bayonet-joint, or screw connection to socket outlets. They are bakelite mouldings in two parts to allow relative rotation between the cylindrical body and disc base, which is a form of removable adaptor permitting two- and three-pin plugs to be readily available without stocking too many body types; the terminal element arrangement may also serve conveniently to fit sockets of different sizes.

The two principal members are connected by means of a ball race which can also function as a thrust block, at the same time being preferably arranged to bear against, on either side of the ball cage, annular metal on the opposing faces of the movable components so as to constitute an integral part of the circuit. In this way is completed one of the "line" connections through the coupling, which possesses at least three "lines" (one of which may afford earthing facilities) by means of spring contacts in association with conducting rings embedded inside the moulding body and disc base respectively, together with a middle connector in abutment centrally against the base plate when the latter is screwed into the body.



Rotatable plug connectors for preventing cable twisting

The moulding is said to be inexpensive to produce in quantity. The connectors are illustrated by the accompanying sectional sketches, which are approximately two-thirds full-size.

Industrial Accidents

What is the "Course of Employment"?

By J. W. Thomas, LL.B., B.Sc., M.I.E.E.

IN determining whether a workman who has been injured is entitled to compensation under the Workmen's Compensation Acts it is necessary to establish that the injury arose out of and in the course of the employment. Difficult problems have often arisen regarding the exact time when the employment commences and when it ends.

The general rule is that it commences when the workman has reached his place of employment, that it continues whilst he is there and it ends when he leaves. He is not usually regarded as being in employment when he is going to or returning from his place of work unless he is actually on his employer's premises at the time. This rule, however, is not an invariable one and there are important exceptions. Thus a workman may be on premises not belonging to his employer but to which he has been sent to do some work for his employer, or he may, during his employer's time, be on his way to some premises where he is to work for his employer.

The Courts have also held that the employment may be continuing even though the workman has finished his work and has actually left the premises at which he was working. Such cases are when a workman travels to and from his work by some form of transport provided by his employers and which he is under a contractual duty to use, or where he is using some road or passage not belonging to his employer but to which he is permitted access in consequence of some arrangement into which his employer has entered with some other person. Thus in one case it was stated :—" It is part of the duty of the master to afford the workman, when he is dismissed, reasonable facilities for leaving the place of employment, and if the servant is injured whilst availing himself of those facilities, the master may be liable."

Much controversy has centred upon the question whether a man going to or leaving his work is entitled to compensation if he meets with an accident. The author quotes some relevant cases in which the Courts have expressed opinions

In another case a carpenter employed in repairing a barge lying in dock, after finishing his day's work left the barge and whilst walking in the dark along the quay, fell over the edge and was drowned. The dock was private property but the man's employers and their workers had permission to pass through the dock on their way to or from the barge. In the course of the judgment it was stated that the workman came through on his way to and from his work and could be regarded as being in the course of his employment whilst passing through the dock. Such passage was within the contemplation of both parties to the contract as necessarily incidental to it. The workman, in order to get to his actual place of work had to enter and leave premises on which he had no right to be and no reason for being, except by the conditions of his employment and in doing so had to encounter dangers which he would not have encountered but for that employment. His death, therefore, occurred during the course of the employment.

Such a result is not confined to cases where the only means of access is over another's property for it has been established that a workman, whilst leaving his employer's premises by one of alternative routes, is in the course of his employment. If he is leaving by any permissible way provided by his employer his employment is continuing.

A Recent Decision

The above legal principles were discussed very fully in the House of Lords last June in the case of *Weaver* v. *Tredegar Iron Company*. The facts were that the respondent company employed a number of men to work as colliers on shift. A workman's shift had come to an end in the afternoon and the new shift had to take their places. The pit lay near a road by which the workmen could walk or cycle to their homes but it also abutted on a branch of the London, Midland and Scottish Railway, running between Newport and Tredegar. There was no regular station but for the convenience of the employers and their workmen, the railway company had made platforms on either side of the line and ran a train each way at the change of shift. Access to the platform was permitted only to the employers' workmen. Practically all the workmen travelled by the train and the employers had made arrangements with the railway company for the issue of tickets to the workmen.

The plaintiff in the case was proceeding, at the end of a shift, to the platform in order to enter a train and in the crush of his fellow workmen on the crowded platform he was pushed off as the train was coming in and lost an arm. The question before the Court was whether the injuries had been sustained in the course of the employment so as to entitle him to recover compensation.

After reviewing the facts the Court was satisfied that at the time of the accident the workman was making use of facilities which his employers had provided for leaving the place of employment and for this purpose was upon premises which his employers had obtained for him permission to use and on which he had no right to be and no reason for being, except by the condition of his employment. The platform was not a public place; it was specially provided by arrangement with the employers for the use of their men. The public had no right of access to it and it was provided solely as a means of access to and egress from the colliery. There was no contractual obligation on the part of the workmen to use it, but there was clearly a practical compulsion because practically all the men used it. It was beyond question a proper and usual means of access and egress provided by the company for that very purpose.

Had the workman sustained the injury whilst in the train or in a public street where the public had the right of access, the accident would have occurred to him merely as a member of the public, but as it was on a platform to which the public had no right of access, it occurred in virtue of his status as a workman. He had not, therefore, left his employment, and the accident arose in the course of and out of the employment. He was therefore entitled to compensation.

Another interesting case bearing upon the same issue was decided in the House of Lords in 1937 (*Blee* v. *London & North Eastern Railway*). A workman finished his ordinary day's work at 5.15 p.m. and in the normal way would have started work again at 7.20 a.m. on the following day. At 10.30 p.m. on the same evening he was called out for emergency duty and whilst crossing the street on his way to work, was knocked down by a motor car and sustained injuries from which he subsequently died. Although his employers had no right to give him orders until he actually arrived at his place of work, his pay commenced from the time he left home. Having regard to those facts it was held that the accident arose in the course of the employment.

The legal principles laid down in the above cases may prove important when questions arise in connection with claims for allowances under the Personal Injuries (Civilians) Scheme which provides that civil defence volunteers shall be entitled to an allowance (or pension) if they sustain a war service injury. This means, in relation to a civil defence volunteer " any physical injury which the Minister certifies to have been shown to his satisfaction to have arisen out of and in the course of the performance by the volunteer of his duties as a member of the civil defence organisation to which he belonged at the time when the injury was sustained." It will be noted that the words " to have arisen out of and in the course of " are similar to those used in the Workmen's Compensation Acts, and it is very probable that in construing them the Courts will have regard to cases which have been decided under those Acts.

Following the principles laid down, it would seem, therefore, that a civil defence volunteer such as an A.R.P. warden who was injured by reason of an ordinary street risk whilst on duty, *e.g.*, by being run over by a motor car whilst going to deal with a fire, or who was injured whilst in a canteen or place of rest provided for civil defence volunteers on duty, would have sustained a war service injury which entitled him to an allowance or pension under the Personal Injuries (Civilians) Scheme.

American Television Development

ACCORDING to the *Journal des Telecommunications*, the U.S. Federal Communications Commission has recently authorised the construction of two new television stations, of which one will be operated in Cincinnati, Ohio, by the Crosley Corporation and the other in New York by the Bamberger Broadcasting Service. The Cincinnati station, of 1 kW capacity, will use wave bands between 50,000 and 56,000 kc/s per second, with definitions using between 441 and 507 lines. The station will chiefly be used for research purposes as to programmes and to establish standards for uniform transmission of the requisite technical quality. Aerial forms and the effect of vertical and horizontal polarisaitons will also be studied.

The New York station, which will be of 1 kW capacity and use frequencies between 96,000 and 102,000 kc/s will also carry out programme experiments and tests of vertical and horizontal aerials. Comparisons will also be made with image definitions between 441 and 729 lines and with from 15 to 30 images per second.

COMMERCIAL and INDUSTRIAL NEWS

Radio Dealers' Problems. Trade Propaganda Films

Radio Retailers

THE May *Electrical Contractor* reports a meeting of the National Association of Radio Retailers, held a month or so ago, in the course of which concern was expressed about the present valve position. It was decided to press for the release of valves for such purposes as replacing faulty valves under guarantee, in sets sold by hire-purchase, or under maintenance and insurance schemes and to maintain existing sets in use.

The revised Schedule of Reserved Occupations was discussed and a member referred to the liability of women to be called up for work of national importance. Some radio firms had already engaged women to fill, as far as possible, positions made vacant by men serving in H.M. Forces ; if these women were now called up, considerable difficulty would arise. The view was expressed that where women had filled the positions held previously by men, they should not be liable for calling up.

It was reported that the Association's radio service postal course was making progress, the number of enrolments showing a continual increase.

A résumé was given of discussions with the Central Price Regulation Committee concerning the margin which should be allowed to retailers of radio products. Specimen figures had been obtained from various parts of the country, and after a careful examination of these, a case had been submitted that although the list prices of goods had increased, so also had retailers' expenses, and at least the existing rate of trade discount should be retained. This had been accepted by the Price Regulation Committee for the present.

Trade with Greece

The Board of Trade and the Ministry of Economic Warfare announce that Greece, except Crete, is to be regarded as enemy-occupied territory for the purpose of the Trading with the Enemy Act and of the blockade.

It is accordingly a punishable offence to have commercial, financial or other intercourse or dealings with or for the benefit of any person in that territory. As from April 30th, moreover, Greek territory other than Crete, will be regarded as an enemy destination for contraband purposes, and all goods of Greek, other than Cretan, origin or owned by persons or firms in Greek, other than Cretan, territory will be liable to seizure.

Supply of Refrigerating Plant

The *Board of Trade Journal* announces that a licence has been issued whereby W. J. Furse & Co., Ltd., may supply service equipment to any person carrying on a business in which refrigerating machinery or plant is used, during such time as refrigerating machinery or plant belonging to that person is being repaired, reconditioned or replaced. Accordingly, individual licences for this company to supply such equipment in these circumstances will not be required.

Action over Electric Hoists

In the King's Bench Division on May 2nd, Mr. Justice Croom Johnson concluded the hearing of an action by the Slough Electrical Co., Ltd., against Mr. Albert Morgan, trading as A. Morgan & Co., for damages for breach of an express oral warranty given upon the sale of two electric hoists. There was a counterclaim by the defendants in respect of work done by them.

The plaintiffs' case was that they agreed to purchase two electric hoists from defendants for £91, and the defendants, they alleged, guaranteed them to work in an efficient manner. They complained that the hoists were not satisfactory. The defendants denied that they had committed any breach or repudiation of the agreement they had made, and denied that any warranty or guarantee was given.

His Lordship, after a hearing extending over several days, gave judgment, and said he came to the conclusion that the defendants' warranty was broken and that the promise of the defendants to put things right had not been carried out. The plaintiffs were therefore entitled to succeed, and he gave judgment for them for £85 13s. The counterclaim failed and there would be judgment for the plaintiffs, with costs in both cases.

Control of Small Tool Exports

Under a Board of Trade Order which comes into force on May 14th, licences will be required to export to all destinations certain engineers' small tools, parts and accessories of machine tools and machine tool jigs. Goods classified "C" in the Export Control list will require licences for export to Liberia and Portuguese Guinea.

The G.E.C. in South America

To meet ever-increasing business, the Anglo-Argentine General Electric Co., Ltd., has recently extended its premises in Buenos Aires. With its "straight line" architecture and its white facia, the new building is in striking contrast to the old building, which has served the company for nearly thirty years. Together they form a composite whole designed to provide an even more rapid service to customers. That the new building and consequent reorganisation has been found necessary is not only indicative of the company's resource and ability to supply the goods, it is also a direct indication that British ships and British sailors still continue to deliver them to their destinations.

The original G.E.C. premises and the new extension at Buenos Aires

X-ray Transformers

The recent revision of B.S.326 of 1928 makes it of more practical value as a performance specification of transformers for energising X-ray equipment. In addition to a number of alterations to the original requirements, an appendix has been added dealing with the electrical performance of complete generators of high voltage. Copies are obtainable from the British Standards Institution, 28, Victoria Street, Westminster, London, S.W.1, price 2s. 3d. post free.

Publicising British Industry Abroad

Though direct war propaganda forms no part of its functions, the Film Department of the British Council is producing a series of films designed to convey to overseas audiences something of the range and power of British industry. Among the topics already covered are London's transport system, shipbuilding, coal, cotton, and London's Green Belt, the last two being in technicolor. Each film runs for ten to fifteen minutes and has undeniable entertainment value. While providing a sound background for war propaganda now, they are likely to achieve even greater prominence in national publicity when peace returns.

War Damage Insurance

The Board of Trade reminds industrialists, traders, farmers, professional men and others affected by the business insurance scheme (which covers plant, machinery, office furniture, business equipment, crops and livestock) that the days of grace allowed for taking out policies of insurance end on May 16th. Persons who do not insure by that date will be covered only from the date on which their application with premium is received. Unless they have insured they will not be entitled to compensation for war damage to property insurable under the scheme. Full information and application forms for insurance can be obtained from a fire insurance company or Lloyd's broker or others carrying on insurance agencies.

Red Cross Appeal

Through the National Federated Electrical Association the Red Cross Penny-a-Week Fund is making a direct appeal to the employers in the electrical industry to bring the scheme to the notice of their employees and to afford facilities for the weekly deduction of contributions from wages. Thanks to the ready co-operation of 32,000 employers throughout the country, the Penny-a-Week Fund has already raised £650,000. Much greater efforts are, however, required to raise funds.

At the beginning of March £4,157,000,

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the following British trade marks. Objections may be entered within a month of April 30th :—

CAF (design). No. 613,622, Class 17. Asbestos and asbestos products, including electrical insulation material, electrical insulators, &c.—Turner Brothers Asbestos Co. Ltd., Clod Mills, Spotland, Rochdale, Lancs.

Duralain. No. 613,858, Class 17. Electrical insulating material, electrical insulators and electrical insulation parts.—Geo. Bray & Co., Ltd., Bagby Works, Leicester Place, Blackman Lane, Leeds.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

LEROYD CO., LTD., meter repairers, present address.

LAURIE & INGLEFIELDS, fittings makers, present address.

NORITE insulation in rods, sheets, etc.

ROHANON steam kettles.

CALRAY, LTD.—Present address.

LEADER inspection handlamp.

raised by the Red Cross, had already been spent on providing prisoners of war with parcels, establishing and equipping convalescent homes for members of the forces, on succouring victims of the war at sea, and on giving immediate personal assistance to those who have been rendered homeless and destitude by enemy action. Details of the scheme may be had on application to the Secretary, Red Cross Penny-a-Week Fund, 89, Kingsway, London, W.C.2.

Trade with South America

At a luncheon last week Lord Willingdon gave an account of his recent tour in South America. According to *The Times*, he said that South America was most anxious to do business with us. He was rather afraid, however, that we had allowed our position to become one of neglected opportunities. We had got to work and to hunt for business, not to expect it to come to us. There was no doubt, he added, that, if we took an interest in what we were doing, we should recover a great deal of the trade we had lost.

Training of Indians

A number of Indians are coming to England to be trained at Government Training Centres, after which they will return to their own country to assist in the development of war industries in India. The men will, in addition to their training at various Centres, visit industrial establishments, and will conclude their training by a working period in a factory.

Fluorescent Lighting Installations

In a note bearing this heading, which appeared in our issue of April 25th, it was stated that the contractors for the "Mazda" fluorescent lamp installation at the Brooke Manufacturing Co.'s works were the E.M.F. (Elec.) Co., Northampton. The B.T.H. Co. now informs us that the statement was incorrect and should have read "the equipment was supplied by the E.M.F. (Elec.) Co." Actually, the installation was carried out by the Brooke Manufacturing Co.'s own electrical staff.

Change of Address

The Ruberoid Co., Ltd., has moved its London office to 1/19, Commonwealth House, New Oxford Street, London, W.C.1.

I.M.E.A. Scottish Centre

The annual meeting of the Scottish Centre of the Incorporated Municipal Electrical Association was held in Glasgow on May 2nd, when the Lord Provost of Glasgow (Sir Patrick Dollan) attended and welcomed the members. Glasgow, he claimed, had the cheapest electricity supply service in the world, energy being sold in the city at ¼d. per kWh. There were 210,000 domestic consumers in the city.

The Lord Provost prophesied that after the war it would become an offence to lay both gas and electricity services to any house since such a duplication of services was a waste of material and labour which the country would be unable to afford during reconstruction. At the annual business session, Mr. J. M. M'Dougall of Greenock was elected chairman for the ensuing year and Mr. G. Morgan, of Glasgow, vice-chairman.

New Catalogues and Lists

Fred W. Davies & Son, Huddersfield.—Particulars of the company's type "S" oil immersed starter.

Moffats, Ltd., Blackburn, Lancs.—The March issue of Moffats' "Sales Chef" containing details of the new "Circulaire" cooker, the "Electropail" for providing supplies of hot water for farm use, etc., and a breakfast cooker.

Friction in Meters

Effects of Dirt and other Foreign Matter

By J. Peacock

Obstructions in the magnet gap of induction-type meters can often be removed on site without opening the case

FEW engineers, other than those directly concerned with the subject, probably realise how slight is the retarding force necessary to stop the disc of the induction-type meter. The friction caused by a very small piece of extraneous matter which has worked its way into either the permanent- or the electro-magnet gap and jammed itself there is, in many cases, quite sufficient to defy even the full-load torque of the meter. On lighter loads, a small filing, or even a hair, brushing the disc in rotation, may cause intermittent stopping or give the meter an appreciable slow error.

Short-term observations into the presence of dirt and foreign bodies in meter gaps, have given the following results: 71 per cent. of obstructions have been in the permanent magnet or "front" gap and 29 per cent. in the electro-magnet or "back" gap. A few odd cases have been noted of obstructions (principally fine hairs) sticking to the inside of the meter case or the inspection window and fouling the disc.

Of the obstructions in the permanent-magnet gap, 38 per cent. have been found to be iron or steel filings or chippings and 54 per cent. specks of dust, plaster from ceilings, paint flakings, hairs and brass chippings, the latter from adjustment or counter-locking screws. Glass and ebonite fragments accounted for 3.7 per cent., while the remainder could be determined only by chemical analysis. About 83 per cent. fouled between the magnet and the top surface of the disc and 17 per cent. between the magnet and the bottom surface. Corresponding figures for the electro-magnet gap were 78 and 22 per cent., a somewhat puzzling discrepancy.

These figures may have been radically altered, of course, since many meters now coming in off circuit have been subjected to bomb concussions and vibrations.

Commissioners' Seals Inviolable

With the inception of the certification of electricity meters came the edict forbidding the breaking of the Commissioners' seals on any quarterly meter, even by a fully-qualified meter inspector of the supply authority. Prepayment meter seals may be broken, for the sole purpose of adjusting the prepayment mechanism of the meter. The rest of the instrument is still inviolable.

This means that any meter found *in situ* to have a gap obstruction has to be removed and a new instrument must be fixed in its place, for although no adjustment or calibration is necessary to free the disc, the Commissioners' seals must, quite rightly, be respected. The meter engineer's bogy, "dirt in gap," may entail a visit of the meter fixer and mate (possibly twice if the consumer is out) and the repairer's time in cleaning the meter and the extraction of a new instrument from the certified stock. In the case of a large works meter it may necessitate many idle hands if the supply has to be cut off during the change of meter and transformers.

Often all this might be avoided by a simple operation. The majority of meters have either (*a*) a top suspension lug, coupled with a fixing and locating screw running through the terminal block, or (*b*) a top suspension lug with fixing lugs at both sides of the meter, generally at the bottom, or (*c*) (as in very few patterns) fixing lugs at the sides of the meter only and no suspension lug.

If the meter inspector notices any dirt, filing or chipping in either gap of the meter, he should from experience be able to tell the intruder by sight and to determine brass from iron or, say, glass from a sliver of bakelite. This would necessitate a good "pencil" torch as a means of spotting through the inspection window. Having determined the position and nature of the obstruction the inspector could, in case (*a*), break the undertaking's seal on the terminal block and, withdrawing the fixing screw unhook the meter free from its moorings. (In cases (*b*) and (*c*) even the breakage of this seal is unnecessary.) Upon turning the meter on its side, gentle tapping of the case (by an engineer-inspector who has knowledge of, and respect for, pivot and jewel loads and stresses) would in many cases, result in the manumission of the disc from the grip of the gap obstruction.

Direction of Tilting

Which way to tilt the meter, left side, right side, face down or back down, would depend upon the peculiarities of the instance. Iron and steel filings and chippings being, of course, magnetic, could not be removed without giving too severe a treatment to the moving system of the meter. There appears to be no remedy for these cases.

Some discretion is necessary in deciding the direction of tilt of the meter, or more harm than good may result. Thus, it would be better invariably to try to remove the obstruction outwards over the edge of the disc to allow it to fall on the bottom of the meter case out of harm's way. If the obstruction is moved to the spindle and left there, centrifugal action will drive it back to its undesired position. Large brass filings should be treated warily for they may be sufficiently long to bridge a live terminal to the case. On prepayment meters the direction of tilt would need consideration from two more points of view, namely, the undesirability of any other dirt falling between the switch faces and the fact that some types have a gravitational lock-in of the toggle.

The gentle tapping or knocking should always have a line of application which is at right angles to the spindle of the meter, in order to avert direct end-to-end shocks upon the jewel surface. For glass, enamel and bakelite fragments, it would only be necessary to turn the meter on its face and shake gently, so that the obstruction falls on to the inspection window, whence it could be eased into a safe position.

Success in some cases would entail reversal of the direction of rotation of the meter (by either pressure or current coils) applying full load to displace the obstruction before disposing of it to a place of safety. Extraneous matter (with the exception of magnetic materials) need occasion no alarm when inside a meter, provided it is below the level of the gaps.

ELECTRICITY SUPPLY

Glasgow Electricity Charges. Shelter Lighting and Heating.

Ashton-under-Lyne. — SWITCHGEAR MODIFICATIONS.—The Town Council is seeking sanction to a loan for e.h.v. switchgear modification.

Barnet.—SHELTER LIGHTING.—The Urban District Council has approved the expenditure of £2,484 for the internal and external lighting of 142 communal shelters.

Blackburn.— MUTUAL AID SCHEME.—The Corporation Electricity Committee has approved a mutual aid scheme with neighbouring electricity undertakings to give assistance in the event of damage by enemy action.

Brighton.—WARNING SYSTEM FOR SCHOOLS. —The Education Committee has approved the installation of a ripple control air-raid warning system in schools.

Clitheroe. — SUBSTATION EXTENSIONS. — The Corporation has approved plans for extensions to a transformer station.

Durham.—SCHOOL WIRING METHODS.—The County Education Committee has been asked by the Board of Education to use another method of wiring for cables conveyed in steel conduits for the electrical installation at East Stanley School, unless the necessary steel conduits are already in hand.

Essex.—ELECTRICITY FOR WARDENS' POSTS. —The County Council has approved the installation of electricity in sixteen wardens' posts at Benfleet.

Falkirk.—METERS AND CONSUMERS' APPARATUS.—The Corporation Electricity Committee has received sanction to borrow £5,750 to meet expenditure incurred on meters and consumers' electrical apparatus.

Glasgow.—ELECTRICITY CHARGES.—In view of the expected satisfactory results of the trading operations for the current year, the Electricity Department is to continue its existing scale of charges until further notice with the following alterations:—Commercial tariff, secondary rate No. 1, for any quantity up to nine times the number of kWh allocated for primary rate, 0.65d. per kWh; secondary rate No. 2, for any quantity thereafter, 0.3d. The primary rate allocation of kWh must be overtaken before the secondary rate No. 1 becomes operative, and secondary rate No. 1 allocation of units must be overtaken before secondary rate No. 2 becomes operative. The allocation of kWh to be consumed at the primary rate before the secondary rates become operative must be not less than that of the year 1940–41. Under the commercial service tariff also the annual fixed charge must be not less than that of the year 1940–41.

MAINS EXTENSIONS.—Special extensions of distributing mains are to be laid at a cost of £4,042.

CABLE RENEWAL.—The Corporation Subcommittee on Sewage Disposal has agreed that the main cables, leading from the storage pump house at Dalmuir sewage works shall be renewed by the Electricity Department at an estimated cost of £650.

BATTERY LAMPS FOR POLICE.—The Corporation Police Committee has authorised the chief constable to purchase, through the Electricity Department, fifty battery lamps at an approximate cost of £80, plus spare batteries and bulbs, for emergency lighting in police stations.

Keighley.—NEW CABLE.—The Corporation Electricity Committee is to lay a new cable at a cost of £900.

Leeds.—LIGHTING SCHEMES.—Electric lighting is to be installed in public shelters, and emergency food and rest centres.

Littleborough. — ALTERNATIVE SUPPLIES —The Urban District Council is seeking permission to make connections for alternative electricity supplies.

Llandudno.—NEW SUBSTATION. — The Town Council proposes to erect an additional electricity substation.

London.—LEWISHAM.—The Borough Council Emergency Committee has obtained approval for the provision of electric heating in public shelters.

Newcastle - on - Tyne. — COLLEGE INSTALLATION.—The City Education Committee is to renew the electric lighting installation at the Rutherford Technical College.

Oldham.—EXTENSIONS.—The Town Council proposes extensions of the electricity supply costing £12,500.

Rushden.—SHELTER HEATING.—The Urban District Council has received permission to install electric heating in public shelters.

Romford.—SHELTER HEATING.—The Corporation Shelter Sub-Committee is to have basement shelters electrically heated. The surveyor has been instructed to ask the Civil Defence Region for approval but not to defer the work until this is received.

Salford. — DEARER ELECTRICITY. — The City Light, Heat and Power Committee proposes to impose an all-round increase of 1/10th of a penny on electricity charges in substitution for previous increases made since the beginning of the war. It is also recommended that the hire charges for appliances should be increased from 5 per cent. to approximately 10 per cent. Increases in coal prices and wages are the principal reasons given for the increases which it is proposed shall come into force in the September quarter.

Shropshire.—LIGHTING OF SHELTERS.—Electric lighting is to be installed in public shelters at Bridgnorth.

Tynemouth.—CUT-OFF TARIFF WITHDRAWN. —The Town Council has decided to withdraw the "cut-off tariff" as previously operated for the time being except in certain cases. Consumers at present using the "cut-off tariff" will be charged at the factory rate.

METER REPLACEMENT.—A sum of £2,000 is to be taken from the reserve fund for the replacement of meters.

X-RAY EQUIPMENT.—X-ray apparatus is to be provided at the infirmary at a cost of £816.

HEATING OF HEALTH OFFICES.—The Corporation Health Committee recommends the installation of electric fires at the health offices at a cost of £43.

Overseas

Eire.—ELECTRICAL DEVELOPMENT.—Arising out of a question put in the Dail, Dublin, by H. M. Dockrell, T.D., last Thursday, asking if the Government of Eire had any plans for a hydro-electric scheme which would increase the output of electricity before next winter, Mr. MacEntee, for the Government, said that no such scheme had been submitted, nor did he think in the present circumstances that any was likely to be forthcoming. The Electricity Supply Board had prepared plans for both hydro and steam plant extension which were anticipated to meet the increased demands for electricity till at least 1942. Among these were the Poulaphouca scheme and the scheme for a peat fuel steam driven station at Portarlington. The outbreak of war and the consequent difficulty of securing plant—practically all of which had to be obtained from abroad—had impeded these plans. The Poulaphouca scheme was nearing completion, and if certain equipment could be obtained in the near future it should be in partial operation by the coming winter.

CHEAPER ELECTRICITY ASKED FOR.—The Association of Municipal Authorities of Ireland is to ask the Minister for Industry and Commerce whether, in view of the shortage of coal and gas, the price of electricity for domestic purposes cannot be reduced.

TRANSPORT

Blackburn.—CO-ORDINATION OF TRANSPORT SYSTEMS.—Representatives of the Corporation Transport Committee are to discuss with representatives of Darwen and Accrington transport undertakings the question of co-ordinating the working of the three transport systems for the duration of the war. Accrington has wholly dispensed with trams and Darwen partly so. Blackburn has retained trams on its principal routes.

Brisbane Electricity and Trams

SUCCESSFUL results of both the Electricity and Tramways Departments are recorded in the annual report of the Brisbane City Council for 1939-40. The operation of the former department discloses a profit of £35,256, as against £26,566 for the previous year, after providing for depreciation, interest, and other charges. The appropriation account provides for a contribution to the City Fund of £74,237 (during the last three years the department has contributed £398,783).

Sales of electricity increased from 71,327,036 to 78,540,414 kWh, while the revenue per kWh sold (1.4152d.) shows a decrease of 0.0079d. The total revenue was £463,120 and expenditure £427,863. New consumers increased by 2,900, giving a total of 61,833. Capital expenditure of the undertaking stands at £1,720,380, and loan liabilities at £1,281,371, whilst £18,275 was paid in the redemption of loans.

During the year, in accordance with the terms of the State Electricity Commission Act, the Commission decided that the Stanley River Dam transmission line should be transferred to the City Electric Light Co., Ltd. Negotiations were entered into and the price fixed for the transfer was the cost of the line less depreciation to the date of sale on February 3rd, 1940.

The value of radio is again demonstrated in the low percentage of lost time of supply due to failure of the system. In all, 17,266 routine calls and tests were made. Messages transmitted were 7,016, and the percentage of acknowledgments was 95.4. Calls to consumers' premises to attend to installation faults and failures of supply numbered 9,093. Visits for the purpose of inspection of new installations, alterations, additions, and periodic inspections were 25,986. Consumers changing tenancy were 10,617, and during the period 289,957 consumers' meters were read.

Whilst the revenue from the carriage of tramway passengers increased by £19,961 over the previous year, much of the expansion was due to the increased number of passengers who took advantage of the travelling concessions provided by the sale of weekly and penny concession tickets, and this improvement in business is not reflected to the same extent in the receipts. This trend has been apparent for some years, and is evidenced by the fact that whereas the revenue this year is £52,426 (or 6.63 per cent.) greater than the pre-depression peak of 1928, over 15,500,000 more passengers were carried, representing an increase of 20.24 per cent. This indicates the extent to which the cost of transport has been reduced, notwithstanding that several tramway extensions have been carried out in the meantime, and the average length of passenger journeys has increased.

An increase in profit from £90 to £41,519 as compared with the preceding year, however, is to a large extent accounted for by a readjustment of accounts. Formerly a contribution of £20,000 annually to the sinking fund was debited against revenue, but this course has not been followed this year, and sinking fund accretions, amounting to £17,412, have for the first time been added to the profit.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specifications (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

19612. "Electro massage devices or the like." J. Capo-Bianco. July 5th, 1939. (535371.)

19678. "Regulation or tap-changing mechanism for electric transformers." Hackbridge Electric Construction Co., Ltd., F. P. Marsh and C. W. Rycroft. July 6th, 1939. (535372.)

19679. "Electrical switch mechanism incorporating mercury switches." Hackbridge Electric Construction Co., Ltd., F. P. Marsh and C. W. Rycroft. July 6th, 1939. (535373.)

22870. "Television video-frequency signal-translating system." Hazeltine Corporation. August 31st, 1938. (535413.)

23148. "Control apparatus." H. N. Negretti, P. E. Negretti and H. W. Ibbott. August 10th, 1939. (535519.)

27211. "Ironing machines." British Thomson-Houston Co., Ltd. October 4th, 1938. (535423.)

27369. "Electric signalling and communication systems." Standard Telephones & Cables, Ltd., W. A. Beatty and C. T. Scully. October 6th, 1939. (535384.)

27370. "Remote control of radio transmitters and receivers." Standard Telephones & Cables, Ltd., W. A. Beatty and C. T. Scully. October 6th, 1939. (535385.)

27372. "Electric wave repeater circuits." Standard Telephones & Cables, Ltd., R. A. Meers, E. R. Cockbain and G. O. Probert. October 6th, 1939. (535386.)

27373. "Time base circuits." Standard Telephones & Cables, Ltd., and W. A. Montgomery. October 6th, 1939. (535387.)

27374. "Radio telegraph systems." Creed & Co., Ltd., D. Salmon and F. B. Mason. October 6th, 1939. (535388.)

27377. "Radio aerial." A. C. Ducati. October 15th, 1938. (Cognate application, 27378/39.) (535425.)

27414. "Microphone amplifiers." G. R. Fountain and A. E. C. Snell. October 7th, 1939. (535391.)

27501. "Electromagnetic deflecting means for use with electron-discharge devices." Baird Television, Ltd., and D. V. Ridgeway. October 9th, 1939. (535477.)

27530. "Electrical sychronising systems." Marconi's Wireless Telegraph Co., Ltd. October 8th, 1938. (535395.)

27677. "Radio transmitters." G. Longo. October 11th, 1938. (535396.)

27847. "Extensible retractile electric cord, and method and apparatus for making it." Standard Telephones & Cables, Ltd. March 3rd, 1939. (535397.)

30984. "Diffusers for non-dazzle headlamps for motor vehicles." Holophane, Ltd., and S. English. November 28th, 1939. (535405.)

31485. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and J. H. Walker. December 5th, 1939. (535406.)

32093. "Refrigerators." British Thomson-Houston Co., Ltd. December 13th, 1938. (535437.)

32519. "Steam condensers of the surface type." Worthington-Simpson, Ltd., and M. H. Adams. December 19th, 1939. (535439.)

32690. "Electric remote-control systems." Westinghouse Brake & Signal Co., Ltd. February 17th, 1939. (535440).

33019. "Refrigerating systems." British Thomson-Houston Co., Ltd. December 30th, 1938. (535443.)

1940

497. "Lighting fittings for use with tubular fluorescent discharge lamps and the like." G. D. Skinner and Benjamin Electric, Ltd. January 9th, 1940. (535445.)

857. "Earth leakage protective systems." General Electric Co., Ltd., H. C. Turner and E. A. M. Edsall. January 15th, 1940. (535446.)

1527. "Contacts for electric circuit-breakers, switches, connectors, and the like." Whitehead Switchgear & Inventions, Ltd., and G. E. Whitehead. January 25th, 1940. (535487.)

2707. "Telephone systems." A. Graham & Co., Ltd., and C. H. Vaughan. February 13th, 1940. (Cognate application, 9213/40.) (535453.)

3188. "Air-spaced concentric conductor cables, and insulating supports therefor." Standard Telephones & Cables, Ltd., and A. J. Maddock. February 20th, 1940. (535457.)

3874. "Electric high-voltage air circuit-breakers." Westinghouse Electric International Co. March 11th, 1939. (535461.)

4216. "Time-lag devices for electrical relays." O. Ellefson and Morecambe Electrical Equipment Co., Ltd. March 6th, 1940. (535463.)

4969. "Electromagnetic charging switches and regulators." R. Bosch Ges. April 14th, 1939. (Addition to 527963.) (535495.)

5083. "Electric announcing systems." Standard Telephones & Cables, Ltd. March 24th, 1939. (535497.)

5230. "Superheterodyne wireless receivers." Philips Lamps, Ltd. March 23rd, 1939. (535500.)

5556. "Piezo-electric devices." Electrical Research Products, Inc. April 5th, 1939. (535507.)

5870. "Electric discharge tubes comprising a plurality of mercury electrodes." Philips Lamps, Ltd. April 3rd 1939. (535512.)

6171. "Electromechanical wave filters." Standard Telephones & Cables, Ltd. July 19th, 1939. (535525.)

6237. "Electric wave filters." Automatic Telephone & Electric Co., Ltd., and J. Grabau. April 6th, 1940. (535529.)

6324. "Unwinding of wire or thread." British Thomson-Houston Co., Ltd. April 7th, 1939. (535533.)

6349. "Method of producing magnetic materials." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 11th, 1939. (Addition to 448046.) (535534.)

6354. "Telephone ringing systems." Electrical Research Products, Inc. April 18th, 1939. (535535.)

6761. "Voltage regulating equipment." British Thomson-Houston Co., Ltd. (Tokyo Shibaura Kabushi Kaisha.) April 15th, 1940. (535544.)

6810. "Circuits for gas or vapour discharge tubes." Philips Lamps, Ltd. April 17th, 1939. (535547.)

6852. "Dust collectors or separators and the like." Davidson & Co., Ltd., and A. S. Caldwell. April 16th, 1940. (535550.)

6912. "Guides for sliding doors." Westinghouse Electric International Co. April 25th, 1939. (535552.)

6966. "Heat regenerators particularly for use in hot gas engines." Philips Lamps, Ltd. April 20th, 1939. (535553.)

7116. "Devices for feeding an alternating current load from a direct current supply." Philips Lamps, Ltd. April 22nd, 1939. (535557.)

7222. "Steam turbines." Escher Wyss Maschinenfabriken Akt.-Ges. June 5th, 1939. (535559.)

8085. "Electric valve rectifying systems." British Thomson-Houston Co., Ltd. May 6th, 1939. (535567.)

Palestine Electrical Imports

Decreased Value in 1939

THE electrical trade of Palestine declined in 1939 in nearly every line, and in spite of a slight recovery in radio goods and unspecified fittings was in the aggregate well below the level of 1938. The following statement showing the values and chief countries of provenance of the principal electrical items in 1939, with a note of increases or decreases on the preceding year, is based on the official returns recently issued in Jerusalem.

Two opposing influences are at work on the economic life of Palestine. On the one hand loss of markets for citrus fruit would have ruined the growers and exporters had the situation not been relieved somewhat by Government loans and guarantees, combined with a scheme of marketing which spreads the loss throughout the whole of the industry.

On the other hand potash and oil products have been selling well, while the presence of troops has brought much activity in many trades and stimulated the sale of a great deal of local produce. Recent events in the Middle East, particularly in Iraq, will no doubt have a considerable influence upon Palestine's external trade.

	1939 £P.	Inc. or dec. on 1938 £P.
Electric cookers—		
Total	4,400	+ 200
From United Kingdom	1,000	− 200
„ France	1,400	+ 1,400
„ Holland	900	+ 600
Electric meters—		
Total	7,700	+ 3,000
From United Kingdom	6,800	+ 4,900
„ Sweden	800	+ 800
Other electrical apparatus—		
Total	39,000	− 18,000
From Germany	4,800	− 3,200
„ United Kingdom	23,400	− 18,600
„ United States	6,700	+ 4,700
Other electrical goods and fittings—		
Total	76,800	+ 24,800
From United Kingdom	48,500	+ 22,500
„ Germany	12,500	− 1,500
„ United States	3,900	+ 2,400
„ Holland	1,300	+ 1,300

	1939 £P.	Inc. or dec. on 1938 £P.
Electric light and power plant—		
Total	33,200	− 68,800
From United Kingdom	28,000	− 54,000
„ Germany	1,000	− 3,800
„ United States	1,300	+ 300
Electric motors—		
Total	27,800	+ 26,300
From Germany	260	− 540
„ United Kingdom	27,500	+ 27,200
Electric cable and wires—		
Total	49,000	− 9,000
From United Kingdom	31,000	− 13,500
„ Holland	4,300	+ 3,000
„ Germany	2,600	− 3,800
„ United States	1,200	+ 1,200
Lamps—		
Total	15,700	+ 7,200
From United Kingdom	2,400	+ 1,200
„ Germany	3,300	+ 2,600
„ Holland	2,000	+ 1,600

	1939 £P.	Inc. or dec. on 1938 £P.
Wireless apparatus—		
Total	51,600	+ 11,200
From United Kingdom	2,000	+ 400
„ Holland	20,500	+ 10,300
„ United States	19,600	+ 2,600
„ Germany	2,340	− 4,400
Batteries and accumulators for motor cars—		
Total	4,200	− 1,800
From United Kingdom	1,100	+ 100
„ Germany	400	− 1,300
„ United States	2,300	− 300
Electric refrigerators—		
Total	24,400	− 2,100
From United Kingdom	1,000	—
„ United States	22,000	—
„ Germany	900	− 2,100
Insulating tubes—		
Total	1,300	+ 100
From Belgium	600	+ 60
„ Germany	700	+ 30

FINANCIAL SECTION

Company News. Liquidations and Bankruptcies. Stock Exchange Activities.

Reports and Dividends

Johnson & Phillips, Ltd., report a trading profit for 1940 of £491,302, as compared with £310,318 for the preceding year. The amount reserved for taxation is £260,000, an increase of £217,500, and the earnings available for the ordinary dividend are therefore lower by £42,249 at £154,571. The ordinary dividend is maintained at 15 per cent. for the year, £5,000 is placed to research and development account, and £30,000 to special reserve for contingencies. £106,026 (against £106,455) is carried forward.

The Ever Ready Trust Co., Ltd.—At the annual meeting on Monday last the chairman (Mr. M. Goodfellow) said that the accounts showed a satisfactory position. Referring to the decision of the board to maintain the dividend at 9 per cent., he said that it was considered better to assist the stockholders in "keeping the wolf from the door" rather than devote a few thousand pounds to strengthening the company's already strong position.

Walsall Conduits, Ltd., is again paying a final dividend of 35 per cent., maintaining the distribution for the year at 55 per cent.

Glenfield & Kennedy, Ltd., report a net profit for the year ended March 31st of £67,537, as compared with £70,549 for the preceding year. The final dividend is 5 per cent., making 10 per cent. for the year, and a cash bonus of 10 per cent. The distribution for 1939-40 was 10 per cent. and a bonus of 7½ per cent.

The Skefko Ball Bearing Co., reports a net profit for 1940 of £180,696, as compared with £253,396 for 1939. It is proposed to pay a final dividend of 10⅝ per cent., making 17½ per cent., tax free, for the year (against 20 per cent.). General reserve receives £30,000, war damage insurance £20,000, and £150,253 is carried forward (against £159,557).

The Power Investment Corporation, Ltd., reports net profits for the year ended March 31st of £23,554, as compared with £30,815 for 1939-40. No dividend is to be paid on the ordinary stock for the year.

Cable & Wireless (Holding), Ltd., & Cable & Wireless, Ltd., announce that, owing to the difficulty in obtaining the necessary data from abroad, it will not be possible to hold their annual meetings until the end of June instead of this month.

Hall Telephone Accessories (1928), Ltd., reports net profits for 1940 of £68,639, as compared with £41,606 for 1939. A sum of £38,200 has been set aside for taxes, general reserve receives £10,000, and the dividend for the year remains unchanged at 10 per cent. The balance carried forward is £10,417 (against £9,743 brought in).

Newman Industries, Ltd., reports net profits of £46,646 for 1940, as compared with £43,108 for the preceding year. From this the following allocations are made :—Income tax reserve, £6,000; preference share redemption reserve, £2,000; air-raid shelter, £500; war damage contribution, £1,000; reserve for additional plant depreciation, £4,500; general reserve, £10,000. The ordinary dividend for the year is unchanged at 20 per cent.

New Companies

Mechanical & Electrical Engineering Co. (Walsall), Ltd.—Private company. Registered April 29th. Capital £5,000. Objects : To carry on the business of mechanical, electrical and general engineers, tool makers, manufacturers of, and dealers in, radio and television apparatus and radio-gramophones, etc. Directors: H. D. Webb, 41, Mellish Road, Walsall, and F. Webb, 90, Sutton Road, Walsall. Registered office: 63, Bradford Street, Walsall, Staffs.

Radio Repair Depot (Leicester), Ltd.—Private company. Registered April 19th. Capital £500. Objects : To carry on the business of radio, television, electrical and maintenance engineers, cabinet makers, &c. Subscribers: M. Wells, 7, St. Martin's East, Leicester; and Mrs. N. M. Horrocks, 78, Romway Road, Leicester. Secretary: E. E. V. Rowley. Registered office: 2a, Evington Road, Leicester.

Atkins, Robertson & Whiteford Ltd.—Private company. Registered in Edinburgh, April 29. Capital £5,000. Objects : To carry on the business of manufacturers and repairers of, agents for and dealers in, transformers, chokes, amplifiers, switches and switchgear, meters, coils, solenoids, battery charging apparatus, etc. Directors : J. Robertson, 95, West Nile Street, Glasgow, C.1, and four others. Registered office : 22, Pitt Street, Glasgow.

Companies' Returns

Statements of Capital

Brown & Co. (Electrical Engineers), Ltd.—Capital £5,000 in 5,000 shares of £1 each. Return dated December 20th, 1940, 4,529 shares taken up. £12 paid. £4,517 considered as paid. Mortgages and charges : nil.

Willet & Robinson, Ltd.—Capital £7,000 in 3,000 cumulative preference "A," 1,000 cumulative preference "B" and 3,000 ordinary shares of £1 each. 3,000 cumulative preference "A" and 3,000 ordinary shares taken up. £6,000 paid. Mortgages and charges: £8,390.

Yale Electric Power Co., Ltd.—Capital £20,000 in 16,700 ordinary and 3,300 preference shares of £1. Return dated October 23rd (filed December 17th), 1940. 16,700 ordinary and 1,000 preference shares taken up. £16,000 paid on 15,000 ordinary and 1,000 preference shares. £1,700 considered as paid on 1,700 ordinary shares. Mortgages and charges: Nil.

B. French, Ltd.—Capital £5,000 in £1 shares. Return dated December 3rd, 1940. 4,750 shares taken up. £4,750 paid. Mortgages and charges: Nil.

Corwen Electric Light Co., Ltd.—Capital £2,000 in £1 shares. Return dated November 22nd, 1940. 1,610 shares taken up. £1,610 paid. Mortgages and charges: Nil.

British Electric Hydrators, Ltd.—Capital £200 in £1 shares. Return dated December 7th, 1940. All shares taken up. £200 paid. Mortgages and charges: £1,100.

Griff Batteries, Ltd.—Capital £3,500 in 1,000 preference shares of £1 and 10,000 ordinary shares of 5s. each. Return dated October 3rd (filed December 24th), 1940. 752 preference and 10,000 ordinary shares taken up. £1,252 paid on 752 preference and 2,000 ordinary shares. £2,000 considered as paid on 8,000 ordinary shares. Mortgages and charges: Nil.

Erimus Electrical Factors, Ltd.—Capital £500 in £1 shares. Return dated December 24th, 1940. 375 shares taken up. £375 paid. Mortgages and charges: Nil.

Kalee, Ltd.—Capital £79,246 in 7,500 "A" preference, 61,250 "B" preference and 10,496 ordinary shares all of £1. Return dated December 30th, 1940. 6,215 "A" preference, 61,250 "B" preference and 10,496 ordinary shares taken up. £20,695 paid. £57,266 considered as paid. Mortgages and charges: Nil.

Grierson, Ltd.—Capital £10,000 in 6,000 ordinary and 4,000 preference shares of £1 each. 4,001 ordinary shares taken up. £4,001 paid. Mortgages and charges: Nil.

Bushing Co., Ltd.—Capital £60,000 in £1 shares. Return dated December 18th, 1940. All shares taken up. £60,000 paid. Mortgages and charges: Nil.

Increase of Capital

Industrial Utilities (Birmingham), Ltd—The nominal capital has been increased by the addition of £900 beyond the registered capital of £100. The additional capital is divided into 355 preference shares of £1 each and 2,180 ordinary shares of 5s. each.

Mortgages and Charges

Barlow-Whitney, Ltd.—Charge on moneys due under certain contract, dated April 4th, 1941, to secure all moneys due or to become due from the company to the Westminster Bank, Ltd.

British Central Electrical Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated April 4th, 1941, to secure £2,000 (ranking *pari passu* with three existing debentures for £1,000 each). Holders: Branch Nominees, Ltd.

L. E. Wilson & Co., Ltd.—Charge on moneys due under certain contracts, dated April 10th, 1941, to secure all moneys due or to become due from the company to the National Provincial Bank, Ltd.

Battery Service (Yorks), Ltd.—Particulars filed of £1,000 debentures authorised March 25th, 1941, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Receivers Released

Arctic Fan & Electrical Co., Ltd.—B. P. H. Preston, of 8, Bream's Buildings, E.C.4, ceased to act as receiver and/or manager on April 12th, 1941.

Charles R. Dibben, Ltd.—Harry N. Phillips, of 11-13, Dowgate Hill, E.C.4, ceased to act as receiver and/or manager on April 8th, 1941.

Liquidations

Northbourne Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. C. J. B. Andrews, 4, Cinema Buildings, Poole Road, Westbourne, Bournemouth. Particulars of claims to the liquidator by May 24th.

Bankruptcies

H. M. Brown (Wood & Co.), electrical engineer, 97, St. Helen's Street, Ipswich.—Application for discharge to be heard on June 11th at the Shire Hall, St. Helen's Street, Ipswich.

S. B. Juster, radio and electrical dealer, 153, Shirley Road, Croydon.—Trustee, Mr. C. R. Waterer, 195–203, Waterloo Road, London S.E.1, Official Receiver, released April 16th.

H. Atterby, electrical contractor, 11, Andrew Road, South Ferriby, Barton-on-Humber, lately residing and carrying on business at 1, Ash Tree Avenue, Great Grimsby.—Trustee, Mr. H. S. Bloomer, 8, Flottergate, Great Grimsby, Official Receiver, released April 21st.

S. Burgoyne, electrician, 1, Mill Lane, Ferrybridge Road, Pontefract.—Trustee, Mr. H. C. Bowling, 24, Bond Street, Leeds, Official Receiver, released April 21st.

R. A. Young, electrical and mechanical engineer, Gullet Passage, Shrewsbury.—Trustee, Mr. F. C. Ormrod, 22, Swan Hill, Shrewsbury, Official Receiver, released April 25th.

W. R. Marchant, electrical contractor, 81, Sandgate Road, Folkestone.—Last day for receiving proofs for dividend May 10th. Trustee, Mr. W. Hillman, Bank Chambers, Ashford, Kent.

E. C. Ford, electrical contractor, 16, Freefolk, Whitchurch, Hants, formerly carrying on business at Victoria Street, Basingstoke.—Receiving order made April 25th, on debtors' own petition. First meeting to-day (Friday), at 12, Rolleston Street, Salisbury. Public examination June 5th, at the Guildhall, Salisbury.

J. K. Thornborough & E. C. Thornborough (J. K. Thornborough & Co.), electricians, Crescent Road, Windermere.—First and final dividend of 1s. 8¼d. payable May 14th, at 16, Cornwallis Street, Barrow-in-Furness. (Amended notice.)

STOCKS AND SHARES

TUESDAY EVENING.

ONCE more it has to be recorded that the strength of 3½ per cent. War Loan stands out as a particular feature of Stock Exchange markets. Various causes conspire to direct large sums into the Consol market, where the 3½ per cent. War Loan, owing to its easy negotiability, remains the popular favourite.

Gilt-edged securities are better in most departments. Central Electricity Board stocks are a point or so to the good, and are difficult to obtain. Electricity supply shares show few changes in price, but continue a firm market. Amongst the equipment and manufacturing shares, a rise of 5s. 3d. in Telegraph Construction is due to the re-entry of the shares into the dividend list. Considerable rises in Home Railway stocks reflect continued investment pressure in a market where supplies of stock are meagre. War conditions account for declines of 1/16 in Palestine Electric "A" shares, and of 3s. 9d. in Whitehall Investment preference. The latter company has large interests in Athens.

Transport Unification

Capital that is seeking employment shows willingness to overflow into the Home Railway market. Scarcity of stock is more than ever noticeable in the cases of the best-class debenture and preference issues ; anything which comes on offer at a reasonable price finds a ready home. Vague talk of nationalisation has given way to discussion of the more practical plan of unification of the Home Railways and other transport companies during the war.

The question of nationalisation is not likely to recur in any serious measure until later on, but closer co-operation between the transport systems is likely to enter the range of practical politics before very long. Southern Railway preferred stock is amongst the speculative favourites of the moment, owing to the high return shown at the present figure. The company's 5 per cent. preference stock is regarded as offering prospect of capital appreciation, in view of the fact that it is a trustee security and pays 5½ per cent. on the money. Both stocks are well up on the week. Thomas Tilling shares are unchanged at 42s. 6d. British Electric Traction deferred has shed 25 points to 750.

Metropolitan Assented

Metropolitan Railway assented stock has come into demand during the past few business days, and the price, which a long time remained about 45, has risen to 47. The position is interesting and unusual. Up to 1948, the dividend will be 3½ per cent., falling to 3 per cent. from that year until 1958. In 1958, the proprietors of Metropolitan assented will be required to exchange £100 of their stock for £67 10s. London Passenger Transport "C" stock, the present price of which is about 31. At 48, the stock on a 3⅛ per cent. dividend basis gives the good return of £6 7s. 6d. per cent. on the money. The dividend may be regarded as secure.

Matters may be very different in 1958 from what they are now, but if they are not, the present price of 47 makes Metropolitan assented look expensive. Seventeen years is, however, a long time to look ahead. After that time, the railways may have been taken over by the Government and a guaranteed stock given in exchange; or various other alternatives, which will readily suggest themselves to the observer, can possibly happen. On the face of it, to-day's price of Metropolitan stock holds attraction for the investor who is not afraid of taking what risks may be involved, in view of the curious conditions governing the future of the stock. But it may be added, as a matter of interest, that several trust companies have recently been accumulating Metropolitan assented stock, accepting such chances as obviously attach to possession of the stock if the proprietors hold it until 1958.

Dividend Declarations

Most of the dividend announcements and company reports, which are now appearing, make a better showing than might have been expected in view of the toll taken by taxation from the profits. A somewhat disappointing result is that of the Isle of Thanet Electric Supply Co., no dividend being declared on the company's 6 per cent. participating preferred shares for the half-year ended March 31st last. The previous price of the ordinary shares—6s. 6d.—had already implied that nothing was to be expected on the ordinary in respect of 1940. It had been hoped, however, that the preferred shares would receive part, if not all, of the 6 per cent. to which they are entitled as a minimum. The dividend is cumulative.

The Laurence Scott dividend of 15 per cent. on the ordinary shares, makes the fourth time which this rate has been paid. The earnings show a decline of £14,000 as compared with those of 1939, but £119,000 is a satisfactory result. The price of the shares has recovered 1s., to 9s. 6d. Newman Industries has declared a 20 per cent. dividend on its ordinary shares of a florin each, these being quoted at about 4s. The company's net profit of £46,600 is £3,500 better than that of the preceding year.

Hopkinsons, Ltd., who manufacture boiler mountings, valves, etc., have declared a dividend of 10 per cent., to make 15 per cent. as before. Profits before allowing for taxation are substantially higher on the year. The price of the shares is 1/16 up at 2 1/16, giving a yield at that figure of 7¼ per cent. on the money. Ever Ready at 26s. are 6d. higher on the repetition of the 40 per cent. dividend and excellent figures for the past year.

Miscellaneous Matters

Amongst the electrical stocks and shares in which there is not much market, prices are disposed to harden, and Electric Construction 7 per cent. preference changed hands the other day at 25s. 9d. Hendon Electrics were recently dealt in at 43s. 9d. Of the radio shares, Pye 8 per cent. preferred were marked at 22s. A few bargains in Marconi 10s. shares show that there is still a little interest in the market, the prices shown in the Stock Exchange lists ranging from 11s. to 12s. 6d.

Coal, iron and steel shares show an improving tendency, and dealers in that market state that they could do a good deal more business if they had a sufficient quantity of shares with which to supply the would-be purchasers. Vickers are a little better at 14s. 9d.; Babcock & Wilcox remain at 39s. 6d. Hall Telephones responded to the satisfactory report with 1/16 advance to 11s. 3d. Revo shares are 9d. up at 20s. 9d.

Cable and Wireless

Cable & Wireless has given notice that the annual meeting, usually held in May, cannot this year take place until the end of June. Speculative investment is favourably inclined towards the company's ordinary stock, the price of which is firm at 62. At this, a 4 per cent., generally-anticipated, dividend would give a return of 6½ per cent. on the money, a very reasonable yield for a stock of this description. Temptation is offered, moreover, by the substantial discount at which the price stands, inquiry being largely directed nowadays towards Stock Exchange securities in which scope exists for capital appreciation. The preference stock is 10s. lower at 98, which is regarded as being a proper value to set upon it until the figures for the year appear. Cable & Wireless 4 per cent. income debenture holds its ground at 100, from which the price rarely moves. There is issued a little over a million pounds of this stock and the market in it is limited.

Telegraph Condenser

Mention was made last week of the return to the dividend list of the ordinary shares in the Telegraph Condenser Co., on which a dividend of 5 per cent. is paid, against nothing in each of the two preceding years. The change-over shown in the company's report is remarkable, the net profits having advanced by £13,400 to £31,900 in 1940. The arrears of dividend on the preference shares is cleared off and the bank overdraft of £16,800 shown in last year's report, no longer appears. Last week mention was also made of the shares being on offer in the Stock Exchange at 8s. 9d. This apparently attracted the attention of buyers, because the shares on offer were promptly taken and the price has advanced to 12s. 6d. middle, which is ex the dividend of 6d. These 10s. shares may appear to be fairly well valued at their par price, but the expansion shown in the profits for last year has raised expectation of a possible dividend increase in respect of the current year.

Dollar Stocks

American Telephone and Telegraph shares have been a weak market in New York on talk of a possible new issue of shares. The equivalent English price is now 185½. The shares are amongst those recently taken over under a Vesting Order by the British Treasury. Up to the present, the British Government has taken over 382 stocks and 131 bonds of United States securities previously belonging to British holders in this country. Liquidation of these securities in New York is proceeding slowly; the firms in whose hands the matter rests being in no hurry to press the securities upon a market which, for some time past, has shown reluctance to absorb more than a moderate amount of sales.

The British Treasury agent in charge of British-owned securities in the United States, has announced that the holdings of these securities so far liquidated come to 158 stock and 26 bond issues. Surprise is frequently expressed at the continued sluggishness of the New York stock market. Those who remember the last war recall the boom which took place in Americans, when, however, conditions were quite different from those of the present day.

Non-inflammable Transformer Liquid

PERFORMANCE of some 1,100 transformers with non-inflammable liquid and totalling over 420,000 kVA has been reported by the Duquesne Light Co. to the *Electrical World*. Of these 886 are network units representing 368,335 kVA. Many of the early causes of failure have been eliminated and recent failures have been largely associated with the primary windings or terminals. There have been no ill effects from operation at or below freezing point. One extensive user reported worse experience per transformer-year with these liquids than with oil-filled transformers, but generally it would appear that while the explosion hazard remains, the fire risk has been reduced.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1941 High-est	1941 Low-est	Dividend Pre-vious	Dividend Last	Middle Price May 6	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	48/6	45/–	15	12½	46/3	..	5 8 3
British Power and Light	27/9	23/–	7	6	24/6	..	4 18 0
City of London	22/6	20/–	7½	7	21/3	..	6 11 9
Clyde Valley	36/6	33/6	8	8	35/–	..	4 11 5
County of London	34/6	30/–	10½	8	30/–	..	5 6 8
Edmundson's:							
7% Pref.	30/–	25/6	7	7	30/–	..	4 13 4
Ord.	25/6	23/6	9	6	25/6	..	4 14 0
Elec. Dis. Yorkshire	39/–	36/–	9	9	38/9	..	4 12 9
Elec. Fin. and Securities	40/–	39/–	12½	12½	40/–	..	6 5 0
Elec. Supply Corporation	37/9	36/–	11½	10	37/6	..	5 6 8
Isle of Thanet	8/–	6/–	2	Nil	7/–	..	—
Lancs Light and Power	31/6	28/6	7½	7½	31/3	..	4 16 0
Llanelly Elec.	21/–	19/6	5½	5½	20/–	..	5 10 0
Lond. Assoc. Electric	16/6	12/6	5½	4½	15/9	..	5 14 3
London Electric	23/6	21/3	7	7	22/6	..	6 4 5
London Power Deb. Red.	105½	102	5	5	102½	..	4 17 6
Metropolitan	34/6	31/–	10	8	31/3	..	5 2 3
Midland Counties	35/6	32/9	8	8	35/–	..	4 11 5
Mid. Elec. Power	35/–	33/3	9	9	35/–	..	5 2 10
Newcastle Elec.	26/3	24/6	7	7	25/–	..	5 12 0
North Eastern Elec.:							
Ordinary	29/–	25/6	7	7	27/6	..	5 1 10
7% Pref.	32/6	29/–	7	7	32/6	..	4 6 2
Northampton	2⅛	39/6	10	10	41/3	..	4 17 0
Notting Hill 6% Pref. (£10)	9	8	6	6	8½	..	—
Northmet Power:							
Ordinary	34/6	28/6	10	7	28/9	..	4 17 4
6% Pref.	29/6	27/3	6	6	29/–	..	4 2 9
Richmond Elec.	19/–	18/–	6	6	18/9	..	6 8 0
Scottish Power	36/6	33/–	8	8	36/3	..	4 8 5
Southern Areas	16/6	14/6	5	5	16/3	+6d.	6 3 0
South London	20/–	19/3	7	7	20/–	..	7 0 0
West Devon	21/6	20/9	5	5	21/3	..	4 14 1
West Gas	18/3	17/3	4½	4½	17/6	..	5 2 10
Yorkshire Elec.	38/3	34/6	8	8	38/3	..	4 4 0
Overseas Electricity Companies							
Atlas Elec.	2/6	1/9	Nil	Nil	2/–	..	—
Calcutta Elec.	37/3	33/–	10*	8*	37/–	..	4 6 8
Cawnpore Elec.	30/–	26/–	10	10	27/6	..	7 5 9
East African Power	25/6	21/6	7	7	25/–	..	5 12 0
Jerusalem Elec.	22/6	19/3	7	7	21/3	..	6 11 9
Kalgoorlie (10/–)	12/6	11/–	7½	7½	12/6	..	6 0 0
Madras Elec.	25/3	24/6	8*	6*	23/9	..	—
Montreal Power	31	30	1½	1½	24½	..	6 2 5
Palestine Elec. "A"	20/6	17/6	5*	Nil	16/3	−⅛	—
Perak Hydro-electric	18/3	16/3	2½	6	17/6	..	6 17 2
Shawinigan Power	18½	16	83cts.	90cts.	15	..	—
Tokyo Elec. 6%	40½	36	6	6	37½	..	16 0 0
Victoria Falls Power	76/6	69/6	15	15	73/9	−⅛	4 1 4
Whitehall Investments Pref.	14/9	8/3	7½	7½	8/9	−3	9 17 3
Public Boards							
Central Electricity:							
1950–76	110½	108	5	5	110½	+½	4 10 6
1955–75	112½	109½	5	5	113	+1	4 8 6
1951–73	108	105½	4½	4½	108	..	4 3 4
1963–93	101	94	3½	3½	100xd.	+1	3 10 0
1974–94	92	87½	3½	3½	93	+1	3 10 0
London Elec. Trans. Ltd.	94	91½	2½	2½	94	..	2 13 2
London & Home Counties 1955–75	108	106	4½	4½	108	..	4 3 4
Lond. Passenger Transport:							
A	120	109	4½	4½	119½	..	3 15 4
B	114	102½	5	5	112½	+1	4 9 0
C	36	29	1½	3	31	..	9 13 6
West Midlands Joint Elec. 1948–68	108	103	5	5	107½	..	4 13 0
Telegraph and Telephone							
Anglo-Am. Tel.:							
Pref.	102½	99..	6	6	102½	..	5 17 1
Def.	24	22	1½	1½	23½	..	6 7 8
Anglo-Portuguese	17/6	15/–	8	8	12/6	−½	12 16 0
Cable & Wireless:							
5½% Pref.	102	93	4½	5½	98	−½	5 12 3
Ord.	63	52½	4	4	62	+1	6 9 3
Canadian Marconi $1	5/–	4/–	Nil	4cts.	5/–	..	3 4 0
Globe Tel. & Tel.:							
Ord.	29/–	26/–	7½*	6*	28/9	..	4 3 6
Pref.	27/6	25/–	6	6	27/6	..	4 7 3
Great Northern Tel. (£10)	14	10½	20	20	12½	..	—
Inter. Tel. & Tel.	3½	2½	Nil	Nil	3	..	—
Marconi-Marine	23/–	19/9	10	7½	22/6	..	6 13 2
Oriental Telephone Ord.	55/6	47/–	12*	11½*	2½	..	4 3 8
Telephone Props.	11/6	11/–	6	6	11/3	..	10 13 4
Telephone Rentals (5/–)	7/9	6/9	10	10	7/3	..	6 18 0

Company	1941 High-est	1941 Low-est	Dividend Pre-vious	Dividend Last	Middle Price May 6	Rise or Fall	Yield p.c. £ s. d.
Traction and Transport							
Anglo. Arg. Trams:							
First Pref. (£5)	2/3	1/–	Nil	Nil	2/–	..	—
4% Inc.	8½	4	Nil	Nil	4½	..	—
British Electric Traction:							
Def. Ord.	830	740	5	45	750	−25	6 0 0
Pref. Ord.	167	150	8	8	160	..	5 0 0
Bristol Trams	40/–	36/–	8*	8	36/3	..	4 8 5
Brazil Traction	8	6½	$1	50c.	7	..	—
Calcutta Trams	19/9	18/6	8	5½	19/–	..	5 15 8
Cape Elec. Trams	17/6	16/6	5	5	17/–	..	5 17 4
Lancs Transport	39/–	36/–	10	10	38/9	..	5 3 1
Mexican Light:							
1st Bonds	40	34½	5	5	40	..	—
Rio 5% Bonds	85½	84	5	5	85	..	5 17 8
Southern Rly.:							
5% Prefd.	53½	43½	5	5	48½	+2½	10 6 2
5% Pref.	94	77½	5	5	90½	+2	5 10 6
T. Tilling	43/6	34/6	10	10	42/6	..	4 14 0
Tilling & B.A.	47/6	45/6	8*	7*	45/9	..	3 1 2
West Riding	36/–	34/–	10	10	36/–	..	5 11 1
Equipment and Manufacturing							
Aron Electricity Ord.	18/6	10/–	15	Nil	18/–	..	—
Assoc. Elec.:							
Ord.	41/–	38/3	10	10	40/–	..	5 0 0
Pref.	36/–	33/3	8	8	35/–	..	4 11 5
Automatic Telephone & El.	47/3	32/–	12½	12½	41/3	..	6 1 1
Babcock & Wilcox	43/3	39/–	10	11	39/6	..	5 11 4
British Aluminium	43/6	39/–	12½	10	40/–	+6d.	5 0 0
British Insulated Ord.	88/3	78/9	20	20	82/6	..	4 17 0
British Thermostat (5/–)	12/3	10/6	18½	18½	12/–	..	7 14 2
British Vacuum Cleaner (5/–)	6/3	6/–	40	12½	6/3	..	10 0 0
Brush Ord.	4/3	3/6	Nil	Nil	4/–	..	—
Callender's	65/6	58/6	15	15	61/3	..	4 17 9
Chloride Elec. Storage	63/6	60/–	15	15	62/6	+⅛	4 15 10
Consolidated Signal	65/–	63/6	17	17	65/–	..	5 4 7
Crabtree (10/–)	23/9	21/3	17½	17½	22/6	..	7 15 7
Crompton Parkinson:							
Ord. (5/–)	19/–	17/9	30	20	18/9	..	5 6 8
E. K. Cole (5/–)	4/9	2/9	10	Nil	4/6	..	—
Elec. & Musical Industries (10/–)	8/6	7/3	5	Nil	7/6	..	—
Electric Construction	27/6	25/–	13½	10	27/6	..	7 5 6
Enfield Cable Ord.	51/–	45/–	16½	12½	45/–	..	5 11 3
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	..	5 0 0
English Electric	31/6	29/–	10	10	31/3	..	6 8 0
Ensign Lamps (5/–)	16/3	15/–	25	25	15/–	..	8 6 3
Ericsson Tel. (5/–)	37/3	35/–	25*	22*	35/–	..	3 2 10
Ever Ready (5/–)	27/6	25/–	40	40	26/–	+6d.	7 13 10
Falk Stadelmann	16/9	13/9	6	7	15/9	..	8 17 10
Ferranti Pref.	25/6	23/6	7	7	25/–	..	5 12 0
G.E.C.:							
Pref.	33/–	30/6	6½	6½	32/6	..	4 0 0
Ord.	81/–	77/–	20	20	80/–	..	5 0 0
Greenwood & Batley	21/–	18/6	15	13	20/–	..	13 0 0
Hall Telephone (10/–)	11/6	10/–	15	10	12/6	+⅛	8 0 0
Henley's (5/–)	21/6	19/6	20	20	20/–	..	5 0 0
4½% Pref.	21/6	20/–	4½	4½	21/3	..	4 4 8
Hopkinsons	40/–	37/6	15	15	41/3	+⅛	7 5 4
India-Rubber Pref.	21/6	19/6	5½	5½	21/3	..	5 3 6
Intl. Combustion	92/6	81/3	32½	30	92/6	..	6 13 4
J. Lucas	58/–	50/6	15	15	56/3	..	5 6 9
Johnson & Phillips	48/3	44/–	12½	15	43/9	−⅛	6 17 0
Lancashire Dynamo	53/6	50/–	25	20	52/6	..	7 12 4
Laurence, Scott (5/–)	10/–	7/–	15	15	9/6	+1/–	7 17 10
London Elec. Wire	25/6	20/–	7½	7½	22/6	..	6 13 4
Mather & Platt	37/9	32/–	13½	10	37/–	..	5 8 1
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	..	5 3 6
Murex	84/6	75/–	20	20	80/–	..	5 0 0
Pye Deferred (5/–)	11/6	10/9	25	25	11/3	..	11 2 2
Reve (10/–)	21/3	18/9	17½	5	20/9	+9d.	2 8 4
Reyrolle	52/6	47/9	12½	12½	50/–	..	5 0 0
Siemens Ord.	20/9	17/–	7½	7½	20/–	..	7 10 0
Strand Elec. (5/–)	2/–	1/–	4	2	2/–	..	5 0 0
S. Smith (1/–)	7/9	5/9	37½	50	6/3	..	8 0 0
Switchgear & Cowans (5/–)	9/–	7/9	10	15	8/9	..	8 11 6
Telegraph Condenser (10/–)	12/6	7/–	Nil	5	12/6xd.	+5/3	4 0 0
Telegraph Construction	39/–	34/6	10	10	37/6	..	5 6 8
Telephone Mfg. (5/–)	7/6	6/9	9	9	7/3	..	6 4 2
Tube Investments	92/6	89/–	23½	23½	90/–	..	5 5 9
Vactric (5/–)	2/3	2/–	4	Nil	2/3	..	—
Vickers (10/–)	16/–	14/–	10	10	14/9	+3d.	6 15 7
Ward & Goldstone (5/–)	19/9	12/6	20	20	16/6	..	5 19 9
Westinghouse Brake	42/6	39/6	17½	10	39/6	..	5 1 3
Walsall Condu'ts (4/–)	26/6	24/6	55	55	26/2	..	8 7 6
West, Allen (5/–)	4/3	3/6	10½	7½	3/9xd.	+2½d.	10 0 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Tenders Invited and Accepted. Schemes Promising Electrical Work.

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parenthesis.

Atherton.—May 17th. Electricity Department. Cast-iron concentric cable service boxes, and house service type quarterly prepayment meters. Particulars from the electrical engineer, Electricity Department, Factory Street.

Birkenhead.—May 12th. Electricity Dept. Stores for six months. (May 2nd.)

Bridgend.—May 21st. Electricity Department. E.h.v. switchgear, transformers, e.h.v. and l.v. cables. (April 25th.)

Cork.—May 24th. North Cork Board of Health and Public Assistance. Supply and installation of mechanical equipment, electric motors and pumps, and other appliances, at Kanturk. Plans and specifications from D. C. Murphy, secretary, County Hospital, Mallow.

Durham.—Improvements to the electrical installations at Bearpark, Thornley, Durham Girls' County and Houghton secondary schools; county architect, 34 Old Elvet.

Maidenhead.—Town Council. May 14th. Seven transformers, in sizes up to 300 kVA. Particulars from C. O. Milton, electrical engineer, Electricity Department, Braywick Road.

South Africa.—DURBAN.—City Council. June 20th. Lightning arrestors, pole fuses, l.v. insulators, enamelled shades and sodium vapour lamps. Battery charging plant and electrical test bench.

July 4th. Five 15-kVA transformers.

JOHANNESBURG.—City Council. June 7th. Electric lighting fittings for Art Gallery. Low-voltage insulators.

PORT ELIZABETH.—City Council. July 24th. Cable, copper wire and house-service cut-outs.

West Midlands.—May 28th. Joint Electricity Authority (Shropshire Distribution Area). Two 7,500-kVA and two 2,000-kVA transformers. (May 2nd.)

May 30th. 12,000-kVA transformer. (See this issue.)

Orders Placed

Barrow-in-Furness.—Electricity Committee. Accepted. Retubing boilers (£1,945).—Stirling Boiler Co.

Cardiff.—Electricity Committee. Accepted. Circulating water pipework (£2,469).—Stewarts & Lloyds. Control room equipment (£7,000).—Metropolitan-Vickers Electrical Co. Penstocks, screens and valves (£2,607).—Ham, Baker & Co. Automatic water level indicators (£292).—Electroflo Meters Co. Transport Committee. Batteries. Contracts extended: —Simms Motor Units, for Exide and Lucas (private car type) batteries; Wm. Lewis & Sons (Cardiff), for Exide and Young batteries; Joseph Lucas, for Lucas (heavy duty) batteries; Marsham Tyre Co. Ltd., for Serf batteries; and E. C. R. Mackadam & Co., for Oldham batteries.

Ealing.—Town Council. Accepted. Switchgear.—English Electric Co. Voltage regulator. Ferranti.

Glasgow.—Transport Committee. Accepted. Trolley wire (value approximately £4,135)—Thomas Bolton & Sons; Whitecross Coy.; Rd. Johnson, Clapham & Morris; Frederick Smith & Co.; I.C.I. Metals; Richard Johnson & Nephew; and British Insulated Cables. Torches for drivers.—G.E.C. Carbon brushes.—Morgan Crucible Co.; Synthetic Carbon & Eng. Co.; Le Carbone.

Greenock.—Town Council. Accepted. Electrical fittings at housing site.—J. S. Denholm.

Keighley.—Electricity Committee. Accepted. 1,000-kW mercury arc rectifier (£3,224).—G.E.C.

Education Committee. Accepted. Emergency lighting at Institute (£187).—Bacon & Coates. Electrical installation at Horkingstone school (£48).—S. D. McKee. Electrical installation at Stanbury school (£45).—A. Imeson.

Lincoln.—Electricity Committee. Accepted. Coaling plant and ash plant.—Babcock & Wilcox. Evaporator.—Aiton.

London.—Joint Electricity Authority. Accepted. Underground cables (extension of existing contracts at revised prices).—Hackbridge Cable Co., Crompton Parkinson, Ltd.; Connollys (Blackley), Ltd.

HAMMERSMITH.—Executive and Civil Defence Committee. Accepted. Extension of contracts for twelve months to March 31st, 1942: E.h.v., h.v. and l.v. cables.—Henley's. 7/0.029 non-bleeding type cable.—Pirelli-General Cable Works. Insulated wires (excluding cotton and silk covered flex).—Edison Swan Electric Co.

LEWISHAM.—Emergency Committee. Accepted. Auxiliary lighting at three A.R.P. depots (£211).—A. J. Hewens & Sons.

Lowestoft.—Works Committee. Accepted. Electrical fittings for 12 months.—Lowestoft Electrical Co.

Northumberland.—County Council. X-ray tube for the Health Department (£47).—Newton and Wright. Electric lighting installation in various shelters (£111).—J. W. Potts.

Taunton.—Electricity Committee. Accepted. Transformers for one year.—British Electric Transformer Co. Health Committee. Accepted. Electric vehicle battery (£141).—Tudor Accumulator Co.

Wakefield.—Rural District Council. Accepted. Electric motor and pump (£118).—Pulsometer Engineering Co.

Windsor.—Education Committee. Provisionally accepted. Electric lighting in trench shelters (£173).—W. Fuller.

York.—Health Committee. Accepted. X-ray set (£1,222).—Victor X-Ray Corporation.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Adwick-le-Street.—Cooking and feeding centres at Woodlands and Skellow, for U.D.C.; surveyor, Urban Council Offices, Adwick-le-Street.

Bedworth.—Mission Church for C.E. authorities; Rev. F. N. Didsbury, The Vicarage, Parish Church.

Boston.—School premises at Church End, Old Leake, for Holland (Lincs.) E.C.; W. M. Smith, county architect, County Hall.

Coseley.—Five "British Restaurants" at Roseville, Princes End, Daisy Bank, Hurst Hill and Ettingshall for U.D.C.; G. E. Mitchell, surveyor, The Council House.

Darley Dale.—Youth hostel, Sydnope Hall; Sir Henry Boot & Sons, Ltd., builders, Banner Cross Hall, Ecclesall Road S., Sheffield.

Dublin.—Completion of 12 shops, Townsend Street, for T.C.; housing architect, 5, Wellington Quay.

Durham.—Temporary school accommodation, Winlaton Mill, for the C.C. (£1,000); county architect, 34 Old Elvet.

Ealing.—Shop, 62, The Broadway, for J. Sears & Co.; Surveyor's Department, Freeman, Hardy & Willis, Ltd., Rutland Street, Leicester.

Church, Beechwood Avenue; Rev. F. C. Minard Perkins, 7, Park Way, Ruislip Road, Greenford.

Gateshead.—Two stores on the trading estate for North-Eastern Trading Estates, Ltd.; H. E. Pitt, Ltd., builders, Millfield, Sunderland.

Grantham.—Alterations, Isolation Hospital, Gorse Lane, for T.C.; P. A. Benn, borough surveyor, Guildhall.

Halifax.—Kitchen and feeding centre, Lower Market, for T.C.; D. T. Lloyd Jones, borough engineer, Crossley Street.

Outpatients' Department to the Halifax Royal Infirmary, cost £14,000; the secretary, Board of Governors, Halifax Royal Infirmary.

Haltwhistle (Northumberland).—Rebuilding of Haltwhistle Social Club and Institute; W. Dixon & Son, 1 Collingwood Street, Newcastle-on-Tyne.

Hartshill.—Conversion of the old administrative offices into dining rooms for staff at the North Staffs Royal Infirmary; the Secretary, Board of Management North Staffordshire Royal Infirmary.

Hexham-on-Tyne.—Communal feeding centre for Urban Council; W. C. Landale, surveyor, U.D.C. offices.

Hull.—Emergency hospital huts (400 beds); city architect.

Kettering.—Electric heating in public air-raid shelters. Communal air-raid shelters at Gretton for T.C.; F. Smith, acting borough engineer, Surveyor's Office, Gold Street.

Leeds.—Proposed churches, Seacroft, Harehills, and Scholes; Rev. R. Emmerson, priest-in-charge, C. of E. Diocesan Board, Ripon.

Leigh.—Structural alterations to the "Railway" Inn, Kirkstall Lane, for G. Shaw & Co., Ltd.,; E. Frankland, resident architect, Head Office, The Brewery, Leigh.

London.—STOKE NEWINGTON.—Shop, 117–9, High Street; Howes & Jackman.

Manchester.—Twelve guest hostels in suburbs for Housing Committee; J. Hughes, Housing Director, Town Hall.

Extensions to brick works, Pink Bank Lane; J. & A. Jackson, Ltd., North Road, Longsight.

Mansfield.—Extensions at County Institution, for Nottinghamshire C.C.; county architect, Shire Hall, Nottingham.

Newcastle-on-Tyne.—Canteen for Ellis & Co.; Cackett, Burns Dick & McKellar, Ellison Place.

Northants.—Extensions, Alfred Street School, Rushden, for E.C.; G. H. Lewin, county architect, County Hall.

Northumberland.—School canteens for County Education Committee; W. W. Tasker, county architect, Mitford Road.

Ogmore and Garw.—Central fire station at Pantynawel, Blackmill, for U.D.C.; A. H. Jenkins, surveyor, Council offices, Brynmenyn.

Openshaw.—Warehouse, Botha Street, for Lindsey and Williams, Ltd.; W. Blackshaw, architect, Queen's Buildings, St. Peter's Square, Stockport.

Pendleton.—Structural alterations to "Swan" Hotel, Eccles New Road; Chester's Brewery Co., Ltd., Ardwick Brewery, Princes Street, Ardwick, Manchester.

Richmond-on-Thames.—Canteen and dining centre, Philanthropic Hall, Parkshot (£2,600), for T.C.; borough engineer, Hotham House, Heron Court.

Romsey and Stockbridge.—New fire station, Stockbridge, for R.D.C.; Surveyor, Council Offices, Duttons Road.

Rowley Regis.—Communal restaurant, Mace Street School Depot, Old Hill, for T.C.; L. J. Taylor, borough surveyor, Municipal Buildings, Old Hill, Cradley Heath, Staffs.

Ruthin.—Junior Agricultural Centre at the Llyfasi Farm Institute for the Denbighshire C.C.; G. D. Wiles, county architect, Acton Hall, Wrexham.

Southend-on-Sea.—Feeding centres at Shoeburyness, Southend, Southchurch, Westcliff, and Leigh, for T.C.; R. G. Baxter, borough engineer, Municipal Buildings.

Stirling.—Communal kitchen (£3,767), for T.C.; town clerk, Municipal Buildings.

Warrington.—Employees' houses, Howley, for T.C.; borough surveyor, Bank Park.

Wolverhampton.—Six community feeding and cooking centres at municipal schools for T.C.; H. B. Robinson, borough engineer, Town Hall.